ASSOCIATION OF ZOOS & AQUARIUMS

CHIMPANZEE
(*Pan troglodytes*)
CARE MANUAL

CREATED BY THE
AZA Chimpanzee Species Survival Plan®
IN ASSOCIATION WITH THE
AZA Ape Taxon Advisory Group

Chimpanzee (*Pan troglodytes*) Care Manual

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Disclaimer: This manual presents a compilation of knowledge provided by recognized animal experts based on the current science, practice, and technology of animal management. The manual assembles basic requirements, best practices, and animal care recommendations to maximize capacity for excellence in animal care and welfare. The manual should be considered a work in progress, since practices continue to evolve through advances in scientific knowledge. The use of information within this manual should be in accordance with all local, state, and federal laws and regulations concerning the care of animals. While some government laws and regulations may be referenced in this manual, these are not all-inclusive nor is this manual intended to serve as an evaluation tool for those agencies. The recommendations included are not meant to be exclusive management approaches, diets, medical treatments, or procedures, and may require adaptation to meet the specific needs of individual animals and particular circumstances in each institution. Commercial entities and media identified are not necessarily endorsed by AZA. The statements presented throughout the body of the manual do not represent AZA standards of care unless specifically identified as such in clearly marked sidebar boxes.

Table of Contents

Introduction

Preamble

AZA accreditation standards, relevant to the topics discussed in this manual, are highlighted in boxes such as this throughout the document (Appendix A).

AZA accreditation standards are continuously being raised or added. Staff from AZA-accredited institutions are required to know and comply with all AZA accreditation standards, including those most recently listed on the AZA website (http://www.aza.org) which might not be included in this manual.

Taxonomic Classification

Table 1: Taxonomic classification for chimpanzees.

Classification	Taxonomy
Kingdom	Animalia
Phylum	Chordata
Class	Mammalia
Order	Primates
Suborder	Hominidae
Family	Homininae

Genus, Species, and Status

Table 2: Genus, species, and status information for chimpanzees.

Genus	Species	Common Name	USA Status	IUCN Status	AZA Program
Pan	*troglodytes*	Chimpanzee	Endangered/Threatened	Endangered	SSP

General Information

The information contained within this Animal Care Manual (ACM) provides a compilation of animal care and management knowledge that has been gained from recognized species experts, including AZA Taxon Advisory Groups (TAGs), Species Survival Plan® Programs (SSPs), biologists, veterinarians, nutritionists, reproduction physiologists, behaviorists and researchers. They are based on the most current science, practices, and technologies used in animal care and management and are valuable resources that enhance animal welfare by providing information about the basic requirements needed and best practices known for caring for *ex situ* chimpanzee populations. This ACM is considered a living document that is updated as new information becomes available and at a minimum of every five years.

Information presented is intended solely for the education and training of zoo and aquarium personnel at AZA-accredited institutions. Recommendations included in the ACM are not exclusive management approaches, diets, medical treatments, or procedures, and may require adaptation to meet the specific needs of individual animals and particular circumstances in each institution. Statements presented throughout the body of the manuals do not represent specific AZA accreditation standards of care unless specifically identified as such in clearly marked sidebar boxes. AZA-accredited institutions which care for chimpanzees must comply with all relevant local, state, and federal wildlife laws and regulations; AZA accreditation standards that are more stringent than these laws and regulations must be met (AZA Accreditation Standard 1.1.1).

AZA Accreditation Standard

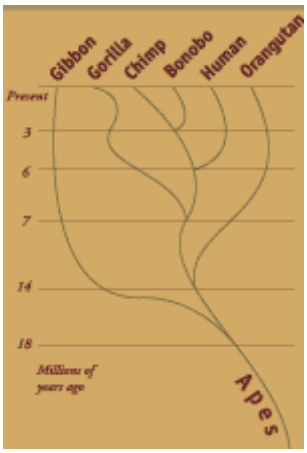
(1.1.1) The institution must comply with all relevant local, state, and federal wildlife laws and regulations. It is understood that, in some cases, AZA accreditation standards are more stringent than existing laws and regulations. In these cases the AZA standard must be met.

The ultimate goal of this ACM is to facilitate excellent chimpanzee management and care, which will ensure superior chimpanzee welfare at AZA-accredited institutions. Ultimately, success in our chimpanzee management and care will allow AZA-accredited institutions to contribute to chimpanzee conservation, and ensure that chimpanzees are in our future for generations to come. Additional guidelines and recommendations for the care and management of chimpanzees in zoos and aquariums that supplement the information provided in this manual can be found in “Care and Management of Captive Chimpanzees” (Brent 2001).

Natural History: The genus *Pan* is composed of two species: *Pan paniscus* (the bonobo) and *Pan troglodytes* (the common chimpanzee). Chimpanzees were once widespread across much of Africa from the southern and western edges of the Sahara to the Cape of Good Hope but are now concentrated in the forests and savannas around the equatorial belt. They have been extirpated in many areas and are currently found in 22 countries in Africa including: Angola, Burkina Faso, Burundi, Cameroon, Central African Republic (CAR), Congo, Côte d'Ivoire, Democratic Republic of Congo (DRC), Equatorial Guinea, Gabon, Ghana, Guinea, Guinea Bissau, Liberia, Mali, Nigeria, Rwanda, Senegal, Sierra Leone, Sudan, Tanzania, and Uganda (Butynski 2001; Nishida et al. 2001).

Chimpanzees live in a variety of habitats associated with the tropical rainforest belt of equatorial Africa. Rainforests typically grow in the lowland areas close to the equator, and have an annual rainfall of at least 1500 mm (60 in), and a dry season of no more than four months (Oates 1986). Previously, *Pan troglodytes* was thought to exist solely in a dense primary rain forest habitat, but more recent studies (Itani 1979) have demonstrated that the species uses a wide variety of habitats, from deep forest to open mixed forest-savanna, from lowlands to relatively high altitudes, with equally diverse strategies for meeting nutritional and reproductive needs. This gives evidence to the extreme flexibility and adaptability of the species (Fulk and Garland 1992).

Chimpanzees and humans share a close evolutionary history, along with the other great apes (Figure 1). Chimpanzees (along with bonobos) are the species most genetically similar to humans. Depending on the form of analysis, humans and chimpanzees share up to 99.4% of their genetic structure. Because of this degree of similarity, some of argued that chimpanzees be reclassified in the Genus Homo, along with human beings (Wildman et al. 2003). This particular taxonomic classification has not been widely accepted presently. Note also that chimpanzees are genetically more similar to humans than they are to gorillas.



Note the order of divergence. Gibbons, then orangutans, then gorillas split off from what eventually becomes the human lineage. The chimpanzee/bonobo line splits from the human line approximately 6 million years ago.

Graphic courtesy of Great Ape Trust:
www.greatapetrust.org/primates/index.php

Figure 1. Great Ape Phylogenetic Tree

The animal care guidelines and recommendations within this document focus exclusively on *Pan troglodytes*. This species is found in four geographically distinct regions of equatorial Africa: *P. t. verus* in western Africa, *P. t. vellerosus*, in eastern Nigeria/western Cameroon, *P. t. troglodytes* in central Africa, and *P. t. schweinfurthi* in eastern Africa (Yerkes 1943; Reynolds and Reynolds 1965; Napier and Napier 1967; Wolfheim 1983; Tuttle 1986; Boyd and Silk 1997).

Physical Description: Chimpanzees are large bodied, robust primates with black or brownish black hair, and pink skin on their bare faces, hands and feet that darkens with sun and age. Chimps have opposable thumbs. They do not have tails; however infants are born with white tail tufts that disappear as they mature. There is little sexual dimorphism between males and females, but males tend to be slightly larger. Standing bipedally, they measure between 0.91-1.5 m (3-5 ft) tall and weigh between 27.2-68 kg (60-150 lb), with Western Chimpanzees and chimpanzees in zoos being larger than others. Both sexes have large, strong teeth with large canines set into heavy jaws. Chimpanzees have flat noses and heavy brow ridges.

The subspecies have been distinguished mainly by geographic range, but some physical differences have also been described. These physical distinctions are more pronounced at birth and subside with age. The degree in which there is individual variation in presentation of the physical distinctions, and the changes associated with age, make identifying the subspecies difficult without precise geographic information or genetic evaluation. The AZA Chimpanzee SSP Program does not manage the zoo population at the subspecies level. However, some other regional associations, such as the European Association of Zoos and Aquaria's (EAZA) European Endangered species Programme (EEP) manage to the subspecies level. The Japanese Association of Zoological Gardens and Aquariums (JAZGA) had previously attempted to manage at the subspecies level but agreed that this was not feasible and has since switched to a single species management paradigm.

Morbeck and Zihlman (1989) published a comparison of body measurements, using data from chimpanzees at Gombe Stream National Park (Tanzania) and a set of other values from managed chimpanzees and other field sites. Though not comprehensive, these data can provide some reference ranges for particular morphological measures.

Conservation status: Common chimpanzees are 'Endangered' under a strict application of the IUCN Red List Criteria and are listed in Appendix 1 of CITES. In parts of West Africa, their subpopulations have become small and highly fragmented. Therefore, the two most western subspecies can be readily categorized as Endangered, especially given the long generation time of the great apes. The central and eastern subspecies are hunted as bushmeat in many areas,

although in East Africa hunting remains at a relatively low level. Logging also disturbs the forest habitat of many central chimpanzee populations.

Interestingly, chimpanzees are “split-listed” under the USFW Endangered Species Act (ESA) in which wild chimpanzees are classified as “endangered” but chimpanzees born in zoos are classified as simply “threatened.” As such, managed chimpanzees are able to be commercialized (bred, sold and purchased as pets) and used in invasive biomedical research.

1.1 Temperature and Humidity

> **AZA Accreditation Standard**
>
> **(1.5.7)** The animal collection must be protected from weather detrimental to their health.

Animal collections within AZA-accredited zoos and aquariums must be protected from weather detrimental to their health (AZA Accreditation Standard 1.5.7). Chimpanzees can tolerate a range of temperatures, but should be allowed choice and control whenever possible to select a temperature range that makes them most comfortable. Outdoor enclosures should provide areas with protection from sun, rain, and winds. Appropriate area might include an available indoor enclosure, tree cover, constructed shelters, or tarps erected outside the reach of the chimpanzees. To a lesser degree, hills, landscaping, and rock outcroppings can provide protection from the elements as well, but they should not be considered adequate on their own. There should be an adequate number of sheltered areas (e.g., one for every 3-4 individuals) to ensure that dominant animals do not prevent other group members from having access. Consideration should be given to the spacing of preferred areas, such as shelters, in order to reduce conflict between individuals competing for these resources.

Cold weather: Individuals should be allowed access to heated areas when the temperature drops below 10°C (50°F). Localized warm areas can be provided using heated forced air, heated floors, heated rocks, or radiant heaters. USDA regulations require that the ambient temperature of the indoor area should never fall below 7°C (45°F) for more than four consecutive hours (AWR 2005), but the AZA Chimpanzee SSP recommends that there should be 24-hour access to areas over 15.6°C (60°F) under normal circumstances. Chimpanzees that are too cold will act in ways similar to humans – shivering, self-clasping, etc to show their discomfort.

Hot weather: The upper limits of temperatures that chimpanzees can tolerate are less well defined, but 29°C (85°F) does not appear to be detrimental to chimpanzees providing there is an adequate flow of fresh air (Fulk and Garland 1992). Chimpanzees that are overheated pant and may be less active. In the wild, chimpanzees spend more time on the ground during warm or dry months (Takemoto 2004), which may serve to effectively maintain optimal body temperature and prevent water loss. Managers should be aware of heat gradients within *ex situ* enclosures as elevated areas may be considerably warmer than areas closer to the ground.

Opportunities for temperature regulation in hot conditions can also include the use of specific water features, including shallow pools and streams (no greater than 61 cm/ 2 ft in depth), sprinklers, and misters. Sprinkler mechanisms should be suitably protected from direct physical access by the chimpanzees. Other cooling devices such as fans and cooling coils may also serve to offer temperature gradients within the enclosures provided to the animals, and access to these gradients are important for chimpanzees in warmer weather.

Humidity: Natural chimpanzee habitat ranges from very humid (low-altitude rainforests) to quite arid (such as the northern limits of chimpanzee range in Senegal and Tanzania). These latter ranges show huge fluctuations in humidity throughout the year (Goodall 1986). In zoos and aquariums indoor humidity levels should range between 30-70%, which matches levels measured at Gombe during the dry season (Clutton-Brock 1972). When humidity is excessive in zoo and aquarium environments due to ambient weather, chimpanzees should be provided with access to indoor areas where humidity can be mitigated to a certain extent. Many of the strategies described above for regulating temperature (e.g., sprinklers, fans, and shade) are also useful in controlling the effect of high humidity. Sources of water should always be available to chimpanzees, especially in conditions of low humidity.

Climate control systems: AZA zoos and aquariums with exhibits which rely on climate control must have critical life-support systems for the animal collection and emergency backup systems available, while all mechanical equipment should be included in a documented preventative maintenance program. Special equipment should be maintained under a maintenance agreement or records should indicate that staff members are trained to conduct specified maintenance (AZA Accreditation Standard 10.2.1). That AZA Chimpanzee SSP recommends a forced humidity HVAC system with double redundancy and 100% outside air return, similar to systems placed in office buildings, schools, and hospitals, with the exception that the air return levels are 100% to help minimize odors. This system is more redundant than systems placed in human-only occupied buildings, since the animals cannot usually be easily moved to safety if an element of the system fails.

> **AZA Accreditation Standard**
>
> **(10.2.1)** Critical life-support systems for the animal collection, including but not limited to plumbing, heating, cooling, aeration, and filtration, must be equipped with a warning mechanism, and emergency backup systems must be available. All mechanical equipment should be under a preventative maintenance program as evidenced through a record-keeping system. Special equipment should be maintained under a maintenance agreement, or a training record should show that staff members are trained for specified maintenance of special equipment.

Systems should be backed up by double redundancy in case of equipment failure. Maintenance should be scheduled as recommended by the manufacturer. Systems should be equipped with alarms to monitor hazardous chemical or gas leaks, fire and smoke, and failure of system and temperature range indicators. Alarms should be set to dial out to specified, trained personnel for appropriate response.

1.2 Light

Careful consideration should be given to the spectral, intensity, and duration of light needs for all animals in the care of AZA-accredited zoos and aquariums. Lighting levels should be approached in the same manner as temperature, with a gradient of light intensity and spectrum available throughout the enclosure. Some areas should have full-spectrum light conditions, and chimpanzees should have the opportunity to select those areas if they desire. Skylights in indoor enclosures can provide natural sunlight during the day, but may or may not allow true, full-spectrum light to penetrate to the exhibit (i.e., glass can prevent/absorb UV light). Natural spectrum bulbs (preferred) or fluorescent bulbs are advised when animals do not have access to natural sunlight for extended periods (greater than one week). Like humans, chimpanzees require vitamin D (see Chapter 5, section 5.1 for additional information), which can be provided by natural spectrum light (wavelength band 290-315 nm with peak conversion at 297 nm).

Light levels within indoor enclosures need to be adequate to allow animal caretakers to clean the facility effectively, and view animals in all areas of the enclosure. The availability of supplemental lighting (e.g., temporary spot lights) should be considered in the event of a medical emergency. Lighting fixtures should generally be mounted outside of enclosures, and far enough away from the chimpanzees to avoid being broken. Industrial-grade fixtures, such as those used in human correctional facilities, are constructed to withstand excessive force in many circumstances, and have been used successfully in indoor night rooms for chimpanzees. Where appropriate, fixtures should be mounted in waterproof and shatterproof enclosures. Where florescent bulbs are used in animal caretaker work areas adjacent to the chimpanzee enclosure, they should be inserted in a plastic sleeve to avoid breakage.

Chimpanzees are equatorial animals, and a 12-hour light-dark cycle is appropriate in most circumstances. No reported ill effects have been reported for chimpanzees provided access to 9-14 hours of lighted conditions per day, a condition that may be necessary for chimpanzees housed indoors during the winter in northern climates. Chimpanzees may be somewhat adaptable in this regard. The use of variable and programmable timers on lighting systems will allow chimpanzees to have longer periods of light during the winter months

1.3 Water and Air Quality

AZA-accredited zoos and aquariums must have a regular program of monitoring water quality for collections of aquatic animals and a written record must document long-term water quality results and chemical additions (AZA Accreditation Standard 1.5.9). Monitoring selected water quality parameters provides confirmation of the correct operation of filtration and disinfection of the water supply available for the collection. Additionally, high quality water enhances animal health programs instituted for aquatic collections.

AZA Accreditation Standard

(1.5.9) The institution must have a regular program of monitoring water quality for collections of fish, pinnipeds, cetaceans, and other aquatic animals. A written record must be maintained to document long-term water quality results and chemical additions.

Water quality: All water sources provided to chimpanzees should be cleaned on a regular basis to ensure that they contain water that is safe to drink. The frequency of cleaning may be dependent on animal usage and algae growth. Any chemicals used to disinfect pools and moats should be approved by the veterinary staff for animal safety and effectiveness, and Material Safety Data Sheets (MSDS) maintained on grounds. Water from other drinking sources (e.g., lixits, etc.) should be routinely monitored for quality using industry standardized methods.

Chimpanzees should have access to fresh clean drinking water throughout the day and night. Water can be offered in containers of various shapes and sizes that are easily sanitized and refilled by hand or automatically, or preferably by the use of an automatic *ad libitum* watering system. Water should be available in multiple locations throughout the exhibit, and at heights accessible by all members of the group. Lixits located too high on a wall may be beyond the reach of young chimpanzees, and alternative sources of water should be provided for these individuals.

Air quality: The USDA regulations require that indoor areas should be sufficiently ventilated at all times to provide for health and well-being, and to minimize odors, drafts, ammonia levels, and moisture condensation (AWR 2005). Ventilation can be provided by windows, vents, fans, or air-conditioning. Auxiliary ventilation should be provided when the ambient temperature is 29.5°C (85°F) or higher.

Ten to fifteen air changes per hour are recommended for small areas (such as holding areas), or areas which contain high densities of animals. This same level should be used for areas with potential contamination, such as sterile surgical areas, necropsy rooms, and waste storage areas. Air entering animal areas should be fresh and should be exhausted without recirculation (i.e. 100% air exchange in animal rooms or equivalent, if possible). Separate zoning of air systems, to prevent cross contamination, should be part of any non-human primate facility.

1.4 Sound and Vibration

Sound and vibration sensitivity: Chimpanzees are particularly attuned to sounds at ≈1 kHz and 8 kHz. Their sound sensitivity is very similar to that of humans (20 Hz-20 kHz) with the exception of a relative loss of sensitivity in the midrange frequencies (between 2 and 4 kHz), which is in a range that is important in human vocal communication. They are also less sensitive to relatively lower frequencies (below 250 Hz) compared to humans, but more sensitive to higher

frequencies, similar to Old World and New World monkey species. (Kajima 1987; Martínez 2004). Chimpanzees do have the ability to hear about one octave higher than humans (Prescott 2006).

Consideration should be given to controlling sounds and vibrations that can be heard by chimpanzees in zoos. When indoor areas that are typically designed with hard surfaces (for durability and ease of cleaning) are used, the resulting acoustic environment can be very loud. It may be possible that the concentration of sound through reverberation may lead to stimulation of apes during displays, but there are no data to confirm this speculation. Anthony (1963) noted the lack of data on noise tolerance for laboratory animals, and suggested creating an acoustic environment similar to the species' natural habitat. Special noise absorbing, cleanable materials are available. The use of strong plastic materials, such as polypropylene, nylon, and lexan, for ape doors and door hardware, can reduce excessive noise while still providing display opportunities for the apes. In addition, recorded natural "soundscapes" can be added to mask the sounds of mechanical systems and increase auditory variety (Coe et al. 2001). Ideally the animals should have the option to choose or avoid loud sounds within their environment. Auditory enrichment is covered in section 8.2.

Potential sources of sound: There are several possible sources of sound in and around chimpanzees in zoos:

- Construction either in the chimp area or adjacent to, including the humans involved in the actual construction work.
- Mechanical equipment including heating and cooling equipment, air handlers, motors, water pipes, automatic watering devices, any type of fans, cage washing machines, water feature equipment such as pumps, filters, etc, horticultural equipment such as blowers, chain saws, lawn mowers, etc.
- Humans including staff and public.
- Caging doors opening and closing.
- Enclosure concrete or gunnite flooring and/or walls.
- Other chimps.
- Outside urban sounds including sirens, airplanes, trains, highway traffic, etc.
- Miscellaneous noise from radios, TVs, loudspeakers, zoo amusement rides, telephones, computers, video monitors, carts, etc.

Measuring, addressing and controlling sound: Construction should be scheduled around the chimpanzees and scheduled at times when the chimpanzees can be properly housed as far as possible from construction activities. For example, schedule necessary construction indoors during spring and summer so that chimpanzees can be outdoors when the work occurs. All construction work should be dependent on chimpanzees' movements, i.e. work begins when animals are moved to other areas and ends when chimpanzees are to be moved back into the area.

Mechanical equipment should be housed in rooms with appropriate doors and walls such that noise from the equipment is greatly reduced. Soundproofing equipment can be used on the doors to minimize noise and the doors should be kept closed at all times. Sound dampening products such as blankets or membranes can also be hung on walls and/or around equipment safely to reduce noise levels. Vents coming from mechanical rooms should also be evaluated for the amount of noise coming through. Any pipes, fans, etc., throughout the chimpanzee holding area should be monitored and evaluated routinely for rattling, squeaking, scraping, etc. Insulating all pipes will reduce rattling noises, but extra wrapping may be necessary in areas where pipes cross each other and may knock together. Regular preventative maintenance on all equipment reduces mechanical noise such as belt squeaking, unbalanced fans and noisy ducts.

Computers and other video equipment should be turned off when humans are not in the building and covered overnight as well. Caregivers can assess the computer equipment in the area to determine if further sound-proofing needs to be done. It is likely that this type of equipment is emitting high frequency sounds which are inaudible to humans but can be heard by chimpanzees.

Humans working with or around the chimpanzees on a daily basis should be trained to realize how much noise they inadvertently add to the animals' environment. Much of the noise that the chimpanzees are exposed to daily will be created by care staff in the course of their routine work. Noise from hosing, raking, work radios, music radios, opening and closing cages, opening and closing doors, equipment such as pressure washers and power tools, telephones, loud talking and yelling are all easy to reduce and/or eliminate with increased awareness. Studies have shown that aggression increases in chimpanzee social groups on days of higher keeper activity (Lambeth 1997).

Recognition of the benefits with auditory stimulation for human well-being has prompted recent research into the value of "sound enrichment" including natural (species-typical) sounds of either conspecifics or their natural environments or other sounds not typically found in the wild (i.e. music) (see Wells 2009 for review). Radio broadcasts, a complex and variable auditory stimuli, has been shown to reduce aggression, agitation and increase social affiliations in laboratory-raised chimpanzees (Howell et al. 2003). Note that factors including the speed and nature of the stimulation should be considered when assessing its utility as enrichment. Videan et al. (2007) showed that instrumental music was more effective than vocal recordings in increasing social interactions in chimpanzees. Vocal music, in contrast, decreased aggressive patterns of behavior. Additionally, the same study suggested that slower tempo vocal music was more effective in reducing aggression in male animals than that with a faster tempo. Together, these results suggest the possible benefits of enhanced auditory environments that should be considered when housing chimpanzees.

Staff should be encouraged to view the chimpanzee enclosures as the chimpanzees' home rather than simply a work space and this seems to help humans be more conscious of their own noise levels. Staff should also be encouraged to remain calm while working with the chimpanzees, even when the animals themselves are quite loud, as chimpanzees can be when they are excited and/or upset, and trying to shout above chimpanzee screaming is pointless and only creates more stress for everyone. Working successfully with a group of upset chimpanzees generally takes acclimation for humans and calmer, more experienced keepers can be invaluable guides to preparing and training less experienced staff. Caregivers should understand that remaining calm around the chimpanzees is an absolute and at times this may be very difficult. Staff can develop their own hand signals to use for communication during these times, in order to be able to understand if doors need opening or closing, etc., when working with the chimps. Work with loud tools should be done when the chimpanzees are not in the immediate area and/or sound dampening blankets can be used if doing noisy work close by is unavoidable. Brooms can be used instead of rakes, doors do not have to be slammed or they can be padded with foam if necessary, and yelling and loud talking eliminated.

Additional variables: Individual chimpanzees, like individual humans, are likely to have varying tolerances for noise, depending on their personal preferences and life experiences. There is nothing definitive known about this, but chimpanzee keepers can observe the individuals that they work with and get a good assessment of each chimpanzees' tolerance levels.

2.1 Space and Complexity

> **AZA Accreditation Standard**
>
> **(1.5.2)** Animals should be displayed, whenever possible, in exhibits replicating their wild habitat and in numbers sufficient to meet their social and behavioral needs. Display of single specimens should be avoided unless biologically correct for the species involved.

Careful consideration should be given to exhibit design so that all areas meet the physical, social, behavioral and psychological needs of the species. Animals should be displayed, whenever possible, in exhibits replicating their wild habitat and in numbers sufficient to meet their social and behavioral needs (AZA Accreditation Standard 1.5.2).

Chimpanzees live in a variety of habitats associated with the tropical rainforest belt of equatorial Africa. Rainforests typically grow in the lowland areas close to the equator, and have an annual rainfall of at least 1500 mm (60 in), and a dry season of no more than four months (Oates 1986). Previously, *Pan troglodytes* was thought to exist solely in a dense primary rain forest habitat, but more recent studies (Itani 1979) have demonstrated that the species uses a wide variety of habitats, from deep forest to open mixed forest-savanna, from lowlands to relatively high altitudes, with equally diverse strategies for meeting nutritional and reproductive needs. This gives evidence to the extreme flexibility and adaptability of the species (Fulk and Garland 1992).

When designing chimpanzee enclosures, appropriately designed and placed furniture such as climbing structures, trees, large rocks, termite mounds, shade and weather shelters, hiding places, or dens, will enhance habitat complexity, reduce boredom, and encourage a variety of behaviors. The ability to engage in climbing, swinging on limbs and vines, arboreal play, and probing for treats may be essential to the normal physical development of infant and juvenile chimpanzees in zoos and aquariums (Coe et al. 2001). The space offered to the chimpanzees should promote species-appropriate behavior, physical/mental development, social interactions, environmental complexity, psychological well-being, behavioral enrichment, observation, visitor education, and the opportunity for the chimpanzees to have as much control over their environment as possible (Fulk and Garland 1992). Chimpanzees are an active species, and environments for chimpanzees in zoos and aquariums should encourage locomotion and exploration, while also providing adequate areas for privacy and resting. A sample chimpanzee ethogram is provided in Appendix K. Specifically, design consideration should be given to the following species-appropriate behaviors:

Locomotion: In the wild, chimpanzees rarely move through the trees very far, and most travel occurs on the ground (van Lawick-Goodall 1968). However, some individuals, especially youngsters, will brachiate from branch to branch. The most common means of locomotion is a quadrapedal walk, with the hind legs slightly flexed and the body inclined forward. Chimpanzees are also capable of bipedalism, but usually use this method of locomotion only for short distances.

Both vertical and horizontal locomotion opportunities should be available in zoos and aquariums. Whenever possible, the ability for chimpanzees to explore all three dimensions of the space should be maximized. Multiple pathways and multiple strata should also be provided to increase the variability and choices of locomotor patterns. A common design flaw in chimpanzee exhibits is to provide several disparate opportunities for climbing without any cross-connections between them at high levels. In other words, chimpanzees can simply climb up and down these features but do not have the opportunity to move arboreally between them. It is recommended that elevated locomotion opportunities are provided. In zoos and aquariums, there are no maximum heights for climbing structures, natural or artificial, as long as safety considerations are met. For instance, very high climbing structures in an open-air exhibit should be sufficiently far from the outer barrier to prevent individuals from making a leap from the top of the structure and over the wall. A 6.1 m (20 ft) gap between structures and the outer wall should be sufficient in the majority of situations, but other factors (angle of the potential jump, handholds to grab on to, etc.) should be considered.

In a study of space use of zoo-housed chimpanzees, Ross and Lukas (2006) found that individuals used all vertical tiers of a 7.6 m (25 ft) high space, but showed preferences for the area closest to the ceiling. Likewise, they spent more time than expected in areas adjacent to doorways, vertical barriers, and corners. As such, facilities should provide environments to cater to these preferences by providing a complex environment with locomotor opportunities on multiple tiers, spaces with multiple areas of access, and additional angled areas in which chimpanzees might feel protected or secure.

Displays: It is important to provide opportunities for chimpanzees to move, hit on, shake, or throw objects in their environment as part of their species-appropriate displays. Care should be taken that these objects are adequately fixed, or that they are not able to cause damage to the enclosure, other chimpanzees, or to human staff or visiting public.

Foraging: In the wild, chimpanzees spend 50-60% of waking time foraging during the day. This includes foraging on the ground for roots, tubers, and grasses, as well as arboreal foraging for fruit, nuts, and tender foliage high above the ground. Many of the foods ingested by wild chimpanzees require some sort of processing, such as cracking open nuts, removing spiny outer layers of fruits, and using tools to extract termites or ants. Scattering and hiding food items in zoos and aquariums will greatly increase the time that chimpanzees spend searching for, processing, and eating their food. In addition, providing climbing structures that allow chimpanzees to mimic foraging in the trees, will increase the amount of

time spent foraging and will add an exercise opportunity. Providing artificial termite mounds or other devices requiring the chimpanzee to retrieve food items (see Chapter 5, section 5.2) promotes foraging, and effectively demonstrates their ability to use tools (Fulk and Garland 1992; Coe et al. 2001). Finally, providing vegetation and trees for natural foraging is a strategy that can be used when sufficient space (and therefore vegetation) is present to allow regeneration of the plant material. If natural vegetation is not growing for chimpanzees in their enclosure, they should be supplied with browse or suitable vegetation (see Chapter 5, section 5.2 for additional information on browse).

Resting and sleeping: In the wild, chimpanzees (with the exception of dependent infants) will construct a tree nest made of vegetation at the end of each day. Nests are usually constructed at a height between 9-12 m (29.5-39.4 ft). Nests are normally only occupied for a single night, but occasionally are reused. Wild chimpanzees spend half of their time in nests, and this should be viewed as an important component of the chimpanzee environment in zoos and aquariums (Pruetz and McGrew 2001). Whether left out in indoor/outdoor exhibits overnight, or shifted into holding areas, chimpanzees should be provided with special nesting areas or raised sleeping platforms (Coe et al. 2001). However, if the substrate is comfortable enough (i.e. deep mulch bedding, or adequate hay, straw, or burlap for nesting purposes), chimpanzees may choose to sleep on the ground. Adequate opportunities for chimpanzees to construct nests for resting should be offered by provision of browse, hay, straw, branches, blankets, or other appropriate materials.

Exhibit design: Social structure and the dynamics of chimpanzee social behavior should be considered when determining both the outdoor and indoor space requirements. In the wild chimpanzees live in a complex fission-fusion society comprised of shifting associations of individuals or groups of chimpanzees (Goodall 1986). One of the most challenging aspects of designing zoo and aquarium environments is to incorporate design elements that allow and promote the complex and fluid social interactions that are characteristic of each age class, sex, and type of individual (Coe et al. 2001). The following features should be considered for inclusion into a chimpanzee facility to optimize the level of care, and address some of the unique aspects of chimpanzee husbandry:

- Weigh stations (see Chapter 8, section 8.1)
- Urine collection areas to provide a means to assist in the on going evaluation of the health status of each chimpanzee (see Chapter 8, section 8.1)
- Nursery and hand-rearing facilities that provide the ability to raise an infant in close proximity to the group (see Chapter 7, section 7.5)
- Medical treatment areas where minor medical procedures can be accomplished without removing the chimpanzee from the building (see Chapter 6, section 6.6)
- Isolation areas for an individual or sub-set that may need to be separated temporarily from the group (see Chapter 6, section 6.6)
- Restraint devices that chimpanzees are trained to comfortably enter to reduce the need for anesthesia (see Chapter 6, section 6.5)
- Specialized research observation areas to enhance data collection, which is an integral part of the management plan (see Chapter 10, section 10.1)
- Caregiver service areas that allow for optimal levels of management (Fulk and Garland 1992)
- Introduction areas with “howdy” areas with mesh barriers for visual and olfactory contact between adjacent spaces (see Chapter 4, section 4.3)

Exhibit complexity: An underlying consideration for zoo and aquarium environments is complexity of design. This refers to the overall variation in the environment (e.g., topography, trees, shade, sunny areas, climbing structures, termite mounds, tall grass, bare areas, swampy areas, streams, pools, large rocks, smooth areas, rough areas, and various sights and sounds). Designing features that mimic the complexity and variety of experiences that wild chimpanzees have will greatly aid the promotion of species-appropriate behaviors and development (Fulk and Garland 1992).

Enrichment: It is a USDA requirement that behavioral and environmental enrichment be provided (and documented) to all non-human primates on a regular basis to promote the psychological well-being of the animals (AWR 2005). Providing enrichment during periods of confinement indoors is essential. Lack of appropriate enrichment has been associated with an increase in social aggression and abnormal behaviors in apes (Maple 1979; Clarke et al. 1982; Maple and Hoff 1982). Holding areas need to be able to accommodate a variety of enrichment items, and to allow for frequent rotation of these items to maintain a high degree of novelty that helps to promote psychological well-being (Fulk and Garland 1992), and also cleaning up after their use. There are no conclusive data to determine the optimal rate of changing or varying enrichment initiatives, but unless reactions by the chimpanzees to novel configurations prove to be stressful, enrichment should be rotated as often as practical. The provision of multiple attachment points for ropes, vines, and other hanging enrichment (such as feeders and puzzles) will facilitate these changes. Attention should also be given to safety and toxicity concerns when providing any type of enrichment. Animal care, management, and veterinary staff should be consulted when implementing new devices. See Chapter 8, section 8.2 for additional information on environmental enrichment.

Control: In the wild, chimpanzees have a good deal of control over their environment. Although there is relatively little empirical evidence to support it, there is growing sense that providing opportunities for chimpanzees to control an increasing number of aspects of their environment in zoos and aquariums will help to maximize their welfare. Elements of control might include being able to choose social partners or microenvironments (e.g., access to outdoors, shade, or preferred locations), but can range to more complex forms of control such as controlling heaters, water spritzers, music, and food scattering devices.

Visual barriers: Visual barriers are considered very important in the design of successful chimpanzee exhibits. Visual barriers are important to block constant visual access to and from the public, as well as from conspecifics. There are mixed results in studies on the effect of visitors on chimpanzee behavior and well-being, but it is widely accepted that chimpanzees should have the opportunity to access areas of their exhibit which are not easily viewable by the public. Visual barriers are also useful for providing escape for individuals following aggressive encounters with conspecifics. The type and form of visual barriers can vary widely from very tall grasses and bushes, semi-transparent burlap or nets, to solid walls or rock formations. A variety of barriers are preferable. Undesirable effects on group dynamics have been observed in zoos and aquariums, where the presence of large crowds of zoo visitors can suppress affiliative behavior and increase aggression (Chamove et al. 1988; Wood 1998). Recommendations for the design of primate enclosures to reduce such effects include increasing the height of the animal enclosures, and lowering the public walkways (Chamove et al. 1988). Research with zoo-housed gorillas demonstrated positive effects of camouflage netting that buffered visitor effects, and decreased aggressive and abnormal behaviors in the animals (Blaney and Wells 2004).

Outdoor access: Access to outdoor environments has been promoted on several fronts as an important element of long-term care of chimpanzees in zoos and aquariums. A study by Baker and Ross (1998) comparing the behavior of pairs and trios of chimpanzees housed exclusively indoors, or with access to the outdoors, found that those groups with access to outdoors showed significantly less abnormal behavior (e.g., coprophagy, regurgitation and re-ingestion), less yawning (a tension-related behavior), and more self-grooming. These results suggest that outdoor access has a major impact on chimpanzee behavior, and the AZA Chimpanzee SSP recommends that all exhibits provide outdoor access for chimpanzees for the majority of the year.

Individual preference: Finally, a key element in exhibit design is the ability to cater to a variety of individual differences. For instance, The AZA Chimpanzee SSP advocates the provision of very tall exhibit spaces (>6.1 m/20 ft), but there should also be consideration given to provision of climbing structures and nesting sites for individuals who are unable to use those areas, such as the disabled or elderly.

Exhibit substrates: The natural substrate of wild chimpanzee environments is a mix of soft and hard materials (e.g., rocks, dirt, grass, and forest litter). Modern zoo and aquarium facilities have experimented with “natural” substrates, including those with dirt, sand, hay, straw, and mulch. Deep-bedding floors show great promise, as they are designed to promote species-typical foraging opportunities, while providing a softer and more comfortable substrate that may have positive effects on behavior as well as joint-related physical ailments. Deep-bedding substrates in use at AZA-accredited zoos typically consist of a 0.3-0.9 m (1-3 ft) depth of bark mulch, of varying sized chips, which cover a solid floor with drainage. Care of these substrates include wetting the surface to prevent it drying out (dusting), turning over the top layer to keep it fresh, and supplementing the mulch as it gets packed down. Feces should be pick-cleaned daily, but urine flows through to the drains beneath. Facilities with recent experience using this system are finding that they require a full bedding change every 2-3 years for 0.6-0.9 m (2-3 ft) of depth.

The use of deep-bedding does not preclude the provision of extra bedding materials, and these materials are especially important in a traditional hardscape area. In the wild, chimpanzees build a nest of branches and leaves to sleep in at night. Providing chimpanzee in zoos and aquariums with items like branches, straw, shredded paper, and blankets, allows them to simulate a natural nest and promotes species-appropriate behavior, and these materials are an essential aspect of the zoo and aquarium environment. Nesting and bedding materials should be routinely checked for feces and urine, and changed regularly.

Water features: Water can be presented via drinking lixits, small streams, pools (<0.6 m/2 ft deep), misters, waterfalls, and light water jets. These may be available constantly (i.e., running water), or intermittently such as activation by human caretaker, or activated by the chimpanzees. Care should be taken to place water sources in different areas of the exhibit, and at different heights to accommodate both smaller and larger animals. All automatic or manually-operated water features should be checked daily to ensure they are in proper working conditions

In general, adult chimpanzees tend to avoid deep water. Deep-water moats pose potential serious hazards to chimpanzees since they do not swim, and their muscle-to-fat ratio does not allow them to float. Chimpanzees have drowned even in shallow water. The AZA Chimpanzee SSP veterinary advisor’s pathology report indicates that drowning has been a significant cause of death in the zoo and aquarium chimpanzee population (Gamble et al. 2004). Water sources used in and around chimpanzee enclosures should be <0.6 m (2 ft) deep, and more shallow if infants have access to the water. If moats are present, care should be taken to have easy access points from which a chimpanzee could exit the water.

Exhibit size: It is difficult to estimate the appropriate space requirements for zoo and aquarium chimpanzee enclosures. The USDA minimum standards for space requirements, for individuals or groups of apes in research facilities that weigh over 25 kg (55 lb), are 2.33 m^2 (25.1 ft^2) by 213.36 cm (84 in) high (AWR 2005). Zoological facilities are required to increase that dimension for any individual weighing more than 50 kg (100 lb). As outlined below, more spacious enclosures are recommended.

Multiple factors affecting the quality of the space likely have significant influences on how chimpanzees perceive the quantity of space. Many of these factors are discussed in this manual, but the most prominent considerations include: 1) Quality and quantity of climbing structures; 2) Placement and quantity of shade structures; 3) Placement and quantity of visual barriers; 4) Placement and quantity of enrichment opportunities; and 5) Size and structure of social group. With these considerations listed, the AZA Chimpanzee SSP proposes the following guidelines for appropriate exhibit space for chimpanzees:

- Small groups (those of 5 or fewer individuals) should be provided with indoor and outdoor space of at least 185.8 m^2 (2000 ft^2), and useable vertical heights of over 6.1 m (20 ft).
- Larger groups require larger exhibits with an additional 92.9 m^2 (1000 ft^2) for every additional individual over a group size of 5. For instance, a new exhibit planning to house a group of 10 individuals should plan for an indoor/outdoor exhibit in which approximately 650 m^2 (7000 ft^2) are available for the majority of the year.
- It is important to note that there is no empirical evidence that the provision of too much space is detrimental to chimpanzees, as they tend to use preferred areas of their environment (Ross et al. 2009). As such, provision of space far exceeding these guidelines is not only acceptable but recommended under the premise that it provides more choices for the chimpanzees.
- Enclosure areas, both indoor and outdoor, should include the ability to move large equipment in and out to facilitate exhibit renovations that may require moving or replacing large trees, rocks, or other exhibit furnishings.

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(10.3.3) All animal enclosures (exhibits, holding areas, hospital, and quarantine/isolation) must be of a size and complexity sufficient to provide for the animal's physical, social, and psychological well-being; and exhibit enclosures must include provisions for the behavioral enrichment of the animals.

The same careful consideration regarding exhibit size and complexity and its relationship to the animal's overall well-being must be given to the design and size of all enclosures, including those used in exhibits, holding areas, hospital, and quarantine/isolation (AZA Accreditation Standard 10.3.3). The size, arrangement, and use of space in the holding area will normally determine the number of chimpanzees that an institution can safely maintain. There should be enough space and environmental complexity in the holding area to prevent serious levels of aggression, and to provide for the psychological needs of the chimpanzees (Coe et al. 2001). As with exhibits, it is difficult to estimate actual dimensions for indoor enclosures. Fulk and Garland (1992) suggest a group with six adult or sub-adult males and eight adult or sub-adult females, and dependent offspring, may have sufficient space with at least two community enclosures that total at least 425 m^3 (15,000 $ft^{3)}$, and six individual holding areas each a minimum of 2.8 m^3 (1,000 ft^3) (Fulk and Garland 1992). The quantity of appropriate holding space will be dependent on the exact configuration, the ability to subdivide areas, and the way in which that space is utilized. In general, the AZA Chimpanzee SSP recommends 9.3 m^2 (100 ft^2) per individual, with ceiling heights of at least 4.6 m (15 ft) for temporary holding areas (i.e., bedrooms) in which the chimpanzees are housed during sleeping hours or for temporary separations (e.g., cleaning, medical procedures, introductions, etc.). It is also advisable to have some smaller areas with relatively low ceilings (1.5-2.4 m/5-8 ft) for use during recovery from anesthesia. Finally, the configuration of indoor spaces is an important consideration. One of the most important aspects is for indoor spaces (including holding) to be able to form a circuit (roundabout), therein avoiding dangerous dead-ends in which vulnerable individuals can be trapped and potentially injured by conspecifics.

Social considerations: It is essential to provide sufficient space to house chimpanzees in social environments. However, under certain conditions, it may be necessary to isolate an individual from a group for a finite period of time. The USDA recognizes the need for housing chimpanzees separately when an individual becomes overly aggressive, or is debilitated as a result of age or other conditions, or when an individual is suspected of a contagious disease. When housed separately, it is beneficial to allow the animal visual and auditory access to other chimpanzees, unless it would prove to be detrimental to their health, safety, or well-being (see Chapter 6, section 6.6 for additional information).

The absolute amount of space a group has available may affect the types of social interactions that can take place. In the wild, population densities vary widely, and are affected by plant densities in the various types of forests, the presence or absence of undergrowth, food distribution and fruiting patterns, and other habitat features. Chimpanzees in the wild often travel in "parties" of 3-7 individuals, with changing party composition over time. Party size may vary within similar habitat types due to the age, sex, and reproductive status of the individual members of the group. Exhibit space needs to be large enough to allow different types of parties to form, and for appropriate social interactions to occur in various parties. Designing environments that allow relatively large groups to be housed will also help promote the wide range of social interactions that are characteristic of the species, and help to promote psychological well-being (Fulk and Garland 1992).

An important consideration for chimpanzee enclosures is the ability for any given individual to choose its own inter-individual distance to conspecifics. Chimpanzees should have enough space to be able to seclude themselves to a certain extent. This can be achieved not only by providing large spaces, but also with appropriate visual barriers placed strategically throughout the space.

Enclosure cleaning: Maintaining a clean and safe living environment helps to prevent disease transfer. The Animal Welfare Act requires that indoor primary enclosures be cleaned at least daily (AWR 2005). Exhibits that are disinfected are usually done so by application of a phenolic disinfectant, sodium hypochlorite, or a quaternary ammonium disinfectant. All surfaces that the chimpanzees come in contact with (including transfer boxes and restraint equipment) should be scrubbed manually, and thoroughly rinsed and dried with a squeegee. If possible, high-pressure water or steam cleaning twice monthly will help remove buildup of organic material on surfaces (Lee and Guhad 2001).

Indoor enclosures: The indoor surfaces that the chimpanzees come into contact with should be designed with cleaning protocols in mind. Many surfaces can be smooth and impervious to debris and moisture so that cleaning and disinfecting is possible. Some indoor areas may have bedding as well, and cleaning protocols will depend on the specific substrate that is present. Sharp edges should be avoided in the design on indoor enclosures, and rough surfaces may make cleaning more labor-intensive. Construction should be of durable material that can withstand regular cleaning and disinfection, as well as rough handling by the chimpanzees. Surfaces that the chimpanzees come into contact with should be free of rust and free of peeling or chipped paint. Wood is an acceptable material for climbing structures and though it cannot be sanitized, it can be replaced when overly soiled.

Outdoor enclosures: The method for cleaning outdoor exhibits will vary with the type of substrate. Natural indoor or outdoor exhibits with dirt or other absorbent substrates should be spot-cleaned on a regular basis. This will ensure that the animal can avoid contact with feces and food waste, which reduces the number of pathogens and pests. The use of biotic substrates, such as mulch floors, will help control bacteria levels. The frequency of cleaning will depend on the size of the exhibit and the number of animals. Porous materials such as rope, fire hose, or burlap should be frequently replaced or steam cleaned.

Pools and moats: Pools and moats should be monitored on a regular basis to ensure that they contain water that is safe to drink. The frequency of cleaning may be dependent on animal usage and algae growth. Any chemicals used to disinfect pools and moats should be approved by the veterinary staff for animal safety and effectiveness (see also Chapter 1, section 1.3).

More information: More information on the considerations of designing adequate space for chimpanzees in light of their natural behavior patterns can be found in Chapter 1 (Pruetz and McGrew 2001) and Chapter 2 (Coe et al. 2001) of "The Care and Management of Chimpanzees" (Brent 2001).

2.2 Safety and Containment

Animals housed in free-ranging environments should be carefully selected, monitored and treated humanely so that the safety of these animals and persons viewing them is ensured (AZA Accreditation Standard 11.3.1).

Animal exhibits and holding areas in all AZA-accredited institutions must be secured to prevent unintentional animal egress (AZA Accreditation Standard 11.3.3). Exhibit design must be considered carefully to ensure that all areas are secure and particular attention must be given to shift doors, gates, keeper access doors, locking mechanisms and exhibit barrier dimensions and construction.

Containment barriers define the environment for the chimpanzee, and separate them from humans. Safety for both the visitor and the chimpanzee must be a top priority. Exhibits in which the visiting public may have contact with animals must have a guardrail/barrier that separates the two (AZA Accreditation Standard 11.3.6).

Designing an environment that allows for high visibility, and even fairly close proximity of the public to the chimpanzees, should be balanced against the need to protect them both (Fulk and Garland 1992). Walls can be made of a variety of materials, such as wood, glass, metal, wire mesh, or concrete. They should be constructed in a manner that will hold up to the activities of the chimpanzees, and should not be climbable unless the exhibit is enclosed. A chimpanzee's motivation to attempt to climb or jump out of a contained area can be stimulated by many factors, including social pressure, surprise from a loud noise, or even the chimpanzees' natural intelligence and curiosity. An outdoor exhibit barrier height of 5.2 m (17 ft) has proven adequate to contain chimpanzees in most cases. However, exhibits should be designed to limit the ability to use trees, structures, or sloping hills to extend jumping heights (Coe et al. 2001). Under the right conditions,

AZA Accreditation Standard

(11.3.1) All animal exhibits and holding areas must be secured to prevent unintentional animal egress.

AZA Accreditation Standard

(11.3.3) Special attention must be given to free-ranging animals so that no undue threat is posed to the animal collection, free-ranging animals, or the visiting public. Animals maintained where they will be in contact with the visiting public must be carefully selected, monitored, and treated humanely at all times.

AZA accreditation standard

(11.3.6) Guardrails/barriers must be constructed in all areas where the visiting public could have contact with other than handleable animals.

chimpanzees are capable of jumping a horizontal distance of 6 m (20 ft) (Coe et al. 2001). Adding a running display through nearby tree branches or structures will increase this jumping distance.

Containment barriers: The containment barriers for a holding facility should consider the strength of the chimpanzees, the reach distance of the chimpanzees, the need for a high degree of visibility, the need for safe physical contact between the caregivers and the chimpanzees, and the need to be able to maintain a clean, healthy environment. Materials such as concrete, welded wire, and solid metal plates can be used successfully to meet the needs of providing optimal holding areas for chimpanzees. Steel bars are not as commonly used because they allow the chimpanzees to reach through. Any barrier that allows chimpanzees to reach through should be supplemented with a secondary barrier (additional mesh) or sufficient space between the maximum reach of an animal and the proximity of humans (visitors or caretakers) so that the chimpanzees cannot reach the humans.

All doors should be double-locked with robust padlocks in any combination, including one or more locks securing the door to the frame, or using padlocks to secure doors via a remote mechanism. Keys should only be distributed to qualified and trained animal personnel.

The USDA mandates that primary enclosures should be constructed and maintained so they: have no sharp edges; protect the chimpanzees from injury; contain the chimpanzees securely and prevent accidental opening of the enclosure; keep unwanted animals from entering the enclosure or having physical contact with the chimpanzees; allow the chimpanzees to remain clean and dry; and provide shelter and protections from temperature extremes and weather conditions unsuitable for chimpanzees (AWR 2005). Consideration of the ways in which animal caretakers access the exhibit are important, and access points should be provided at multiple areas of the exhibit, and with safety as a top priority.

Another consideration for barriers in chimpanzee enclosures is the degree to which they prevent access by indigenous wildlife. In most chimpanzee exhibits, resident animals such as rabbits, squirrels, and skunks are able to enter the chimpanzee exhibit. In most cases, this results in some form of aggression from the chimpanzees, often resulting in the death (but more rarely the consumption) of the wildlife (Ross et al. 2009). In some cases, this may be a source of zoonotic disease transmission although those cases are relatively rare.

Water moats: Water moats have been used as a barrier for containing chimpanzees, however, they are not recommended by the AZA Chimpanzee SSP. In general, adult chimpanzees tend to avoid water, although there are exceptions. Shallow water is not an adequate barrier to prevent escape. Deep-water moats pose potential serious hazards to chimpanzees, since they cannot swim and their muscle to fat ratio does not allow them to float. Chimpanzees have drowned even in shallow water; water levels should not exceed 0.6 m (2 ft) in depth to minimize this risk. Even in shallow water moats, hand holds or stepping stones should be provided to allow chimpanzees to get out of the water and back into the enclosure easily.

Security zones: Chimpanzees are extraordinary escape artists. Because chimpanzees may escape from primary indoor enclosures, containment within secondary safe areas is essential. Subdividing containment areas into separate safety zones is becoming a common practice. The highest security is the area occupied by the chimpanzees. Secondary security areas outside of the primary containment area need to be able to hold chimpanzees for the period of time it takes to retrieve the chimpanzees and relocate them back into the primary safety area. These secondary areas need to be designed not only to hold the chimpanzees, but also to keep them from getting hurt. In these secondary security areas, lamp bulbs containing toxic materials or appliances that could cause electrocution should be avoided. All fixtures should be mounted securely on walls. Mesh or “dart ports” should be provided to allow qualified staff to immobilize the chimpanzees when necessary. Some facilities provide mesh ceilings to prevent escaped chimpanzees from gaining access to air ducts, pipes, lights, and fire sprinklers. Tertiary security areas are intended for qualified staff, researchers, or helpers. These areas include food preparation areas, tool storage, and changing areas. Mechanical equipment rooms or other areas used by non-qualified staff should be accessed from outside the exhibit (Coe et al. 2001).

Containment recommendations: Access to on-exhibit areas during evening hours can be a useful way to provide chimpanzees with increased choices of movement and location, however; containment security is of the utmost importance to maintain human and chimpanzee safety. Extra safety features should be considered in order to utilize the space more often for the chimpanzees. Access to open air outdoor areas overnight should include the use of high voltage wire for secondary containment. The power supply for the electric wiring should be backed up by a solar panel that automatically continues the voltage in the event of power failure. When given access to open air outdoor exhibit areas overnight, staff should be extremely diligent about checking all items in the exhibit for structural soundness, ensuring that climbing structures, enrichment devices and any trees are secure and stable. It is good practice to bring in all chimpanzees at the end of the keepers’ working day, check the outdoor enclosure, and then give the chimps access again if planning to allow them overnight access to the area. If severe weather is predicted or threatening, or any weather that includes high winds, the chimpanzees should not be given access to open air outdoor enclosures due to the danger of a tree blowing over in or into the exhibit.

Overnight access to indoor exhibit areas requires that keepers and other personnel treat the space as if it were always occupied or going to be occupied in order to minimize the chance of safety breaches; these areas should always

remained locked and any tools or other equipment removed from the enclosure and its near vicinity. Indoor exhibit areas that chimpanzees are given 24 hour access to should be surrounded by the remainder of the building, thereby creating secondary containment on all sides. Special care should be taken with indoor enclosures that have skylights or windows to make sure that these are secure and cannot be reached with sticks, toys, tools or other items that chimpanzees may be able to use. If able to possibly be reached by the chimpanzees, the skylights or windows should be covered with heavy duty mesh or other material to prevent escape.

Simple signs can be created and placed in appropriate places for staff to easily see that indicate if the chimpanzees are in the enclosure or not overnight; these help to reduce communication errors between shifts of caregivers.

Pest control: Pest control should be considered as an important factor during exhibit design. Cockroaches seek tight dark areas. Small openings, such as between steel barrier frames and masonry walls, or penetrations into tubular steel frames, should be sealed. Mounting counters, cabinets, or shelves away from walls, as well as maintaining open space around furnishings, gives pest species nowhere to hide. The use of open shelving made of wire mesh also limits hiding places. Drain covers with tight fitting mesh drain baskets help prevent movement of insects and rodents through the sewer systems. Many features contribute to the creation of rodent habitat, both indoors and outdoors. Food availability is probably the most critical factor. Since rodents are nocturnal by nature, removing food scraps at the end of the day should help to limit rodent problems.

Emergency Safety: All emergency safety procedures must be clearly written, provided to appropriate staff and volunteers, and readily available for reference in the event of an actual emergency (AZA Accreditation Standard 11.2.3). Staff training for emergencies must be undertaken and records of such training maintained. Security personnel must be trained to handle all emergencies in full accordance with the policies and procedures of the institution and in some cases, may be in charge of the respective emergency (AZA Accreditation Standard 11.6.2).

AZA Accreditation Standard

(11.2.3) All emergency procedures must be written and provided to staff and, where appropriate, to volunteers. Appropriate emergency procedures must be readily available for reference in the event of an actual emergency. These procedures should deal with four basic types of emergencies: fire, weather/environment; injury to staff or a visitor; animal escape.

AZA Accreditation Standard

(11.6.2) Security personnel, whether staff of the institution, or a provided and/or contracted service, must be trained to handle all emergencies in full accordance with the policies and procedures of the institution. In some cases, it is recognized that Security personnel may be in charge of the respective emergency (i.e., shooting teams).

Fire: Fire alarm systems are recommended. Alarms should automatically call the Fire Department and appropriate chimpanzee care and management personnel. Fire safety plans for chimpanzee holding should include safe doors to open and lead chimps to a secure outside enclosure at any time of the year. Plans may also include training overnight personnel who do not regularly access the building in emergency protocols to ensure chimpanzee safety, as these people will presumably be first on the scene in the event of a fire during hours in which animal care staff are not present. All chimpanzee personnel should be trained to properly use fire extinguishers and fire extinguishers should be kept and maintained around the area.

Weather: A Disaster Supplies Kit (see list below) should be assembled and kept in the building and checked and assessed quarterly. Chimpanzee holding facility buildings are typically constructed of thick, concrete walls with few entrances or large windows, making them ideal safe places during extreme weather events such as hurricanes and tornadoes. High ceilings and existing drains also increase the possibility that the building is safe during severe weather.

Hurricane: Preparations for hurricanes in chimpanzee housing should be similar to human hurricane preparation. All chimpanzees should be locked inside and preparations made to provide both the humans who stay with the chimpanzees, and the chimpanzees themselves, fresh water and food for several days.

Severe thunderstorm or tornado: Preparations for severe thunderstorms or tornados in chimpanzee housing should be similar to human severe thunderstorm or tornado preparation. All chimpanzees should be locked inside. Care should be taken to move animals into areas away from large sheets of glass that might shatter during high winds. After the tornado passes:

- Watch out for fallen power lines and stay out of the damaged area.
- Listen to the radio for information and instructions.
- Use a flashlight to inspect your building for damage.
- Do not use candles at any time.

Flood and earthquake: Know the area's potential risks for these events, and keep the Disaster Supplies Kit on hand, along with food and water for all chimpanzees and caregivers.

Disaster Supplies Kit:

- First aid kit and essential medications.
- Canned food and can opener.

- At least three gallons of water per person (for humans and chimpanzees)
- Protective clothing, bedding, or sleeping bags (for humans and chimpanzees)
- Battery-powered radio, flashlight, and extra batteries.
- Special items for infant, elderly, or disabled individuals
- Written instructions on how to turn off electricity, gas, and water if authorities advise you to do so (a professional must turn natural gas service back on.)
- Store supplies in a waterproof, easy-to-carry container, such as plastic tub with handles

*Information taken from Red Cross website, www.redcross.org

Emergency drills should be conducted at least once annually for each basic type of emergency to ensure all staff is aware of emergency procedures and to identify potential problematic areas that may require adjustment. These drills should be recorded and evaluated to ensure that procedures are being followed, that staff training is effective and that what is learned is used to correct and/or improve the emergency procedures. Records of these drills should be maintained and improvements in the procedures duly noted whenever such are identified. AZA-accredited zoos and aquariums must have a communication system that can be quickly accessed in case of an emergency (AZA Accreditation Standard 11.2.4).

AZA Accreditation Standard

(11.2.4) The institution must have a communication system that can be quickly accessed in case of an emergency.

Institutions holding chimpanzees should have agreements with their local fire, police and other emergency personnel regarding dangerous animal escapes, which will include chimpanzee. Institutions can define acceptable parameters of responsibility for the escape. For example, within the zoo perimeter zoo personnel are responsible, but outside zoo perimeter fences, the city and/or county emergency response personnel have authority.

AZA-accredited zoos must also ensure that written protocols define how and when local police or other emergency agencies are contacted and specify response times to emergencies (AZA Accreditation Standard 11.2.5). Because of the potential danger of a chimpanzee escape, response times should be within 10 minutes of notification.

AZA Accreditation Standard

(11.2.5) A written protocol should be developed involving local police or other emergency agencies and include response times to emergencies.

Species specific attributes: AZA-accredited zoos and aquariums which care for potentially dangerous animals must have appropriate safety procedures in place to prevent attacks and injuries by these animals (AZA Accreditation Standard 11.5.3). *In situ*, chimpanzees hunt, kill and consume other animals both in groups and alone. Chimpanzees also may kill chimpanzees that are unknown to them both in efforts to protect territory and in efforts to expand existing territory. Chimpanzees are highly intelligent, agile and easily several times stronger than a human. Chimpanzees kept as pets have attacked and severely injured human beings.

Safety procedures: It is recommended that caregivers have protected contact only with chimpanzees. An exception would be in the case of an infant who is being hand reared (see guidelines Section 7.5).

It is advisable that new chimpanzee caregivers be thoroughly trained in chimpanzee behavior, as well as given instruction on the preferences and personalities of each individual chimp they will be working with; it should be stressed that it takes time to build a trusting relationship with chimpanzees and each individual person and chimp will develop that relationship at their own pace.

Training of new staff should involve stages of actually dealing directly with the chimpanzees and progression should depend on both the chimpanzees' and the keeper's comfort level. If keepers are uncomfortable being near, feeding or shifting chimpanzees it can create a potentially dangerous situation for the person and this factor should always be carefully considered during staff training. Supervisors who are familiar with the chimpanzees should always be physically present during times of new staff working with chimpanzees to be available if problems occur, to answer questions and provide guidance.

AZA Accreditation Standard

(11.5.3) Institutions maintaining potentially dangerous animals (sharks, whales, tigers, bears, etc.) must have appropriate safety procedures in place to prevent attacks and injuries by these animals. Appropriate response procedures must also be in place to deal with an attack resulting in an injury. These procedures must be practiced routinely per the emergency drill requirements contained in these standards. Whenever injuries result from these incidents, a written account outlining the cause of the incident, how the injury was handled, and a description of any resulting changes to either the safety procedures or the physical facility must be prepared and maintained for five years from the date of the incident.

Animal attack emergency response procedures: Animal attack emergency response procedures must be defined and personnel must be trained for these protocols (AZA Accreditation Standard 11.5.3). If a chimpanzee escapes into an unsecured area and attacks a human, the escaped chimp may be considered a target of shoot to kill by zoo personnel. Zoo staff emergency response team should have a protocol outlined dealing with escaped animals who are considered potentially dangerous enough to shoot to kill in the case of certain events such as an escaped animal attacks a human, or an escaped animal breaches zoo perimeter fence.

Each facility should follow AZA standards regarding emergency response, housing weapons, tranquilizer guns and other capture equipment in designated areas for emergency response personnel to obtain easily and quickly.

If shooting the chimpanzee to save the human's life is not a reasonable option due to proximity of human(s), there are several options that may be appropriate:

- Spraying the animal with a high pressure water hose to try to get the chimpanzee away from the person being attacked.
- Spraying the chimpanzee with a fire extinguisher and/or sound a loud noise, such sounding an air horn, may divert the chimpanzee's attention long enough for the human to get to safety.
- Dropping a cargo net over the chimpanzee may entangle the animal, thus allowing the attacked person, if able, to get away, or allowing other people to drag the human to safety.

Anyone attempting to divert the chimpanzee's attention away from the human victim also risks being attacked themselves, so great caution should be taken with any approach in this extremely dangerous situation. Any attempts to wound the chimpanzee in order to stop the attack should be considered in light of the fact that chimpanzees are much stronger than humans, and that the chimpanzee attacking already is experiencing a tremendous surge of adrenaline that will make him even stronger.

Animal escape: If a chimpanzee escapes into a secured area or a staff member makes an error and is caught in the enclosure with a chimpanzee, essentially the same response applies. It may be more dangerous for anyone caught inside of what the chimpanzee considers his territory, and it is certainly more dangerous if multiple chimpanzees are inside the enclosure with the human. Any human encountering an escaped chimpanzee should exercise extreme caution if approached by the chimpanzee and/or if necessary to stay in proximity to that chimpanzee. Remaining calm is of utmost importance, as the chimpanzee may become (more) agitated based on the human's behavior.

Animal attack emergency drills should be conducted at least once annually to ensure that the institution's staff know their duties and responsibilities and know how to handle emergencies properly when they occur. It is recommended that a variety of scenarios be modeled during drills, including:

- Single chimpanzee escapes into secure area (i.e. holding area)
- Multiple chimpanzees escape into secure area (i.e. holding area)
- Single chimpanzee escapes into unsecure area within the facility (i.e. staff area)
- Multiple chimpanzees escape into unsecure area within the facility (i.e. staff area)
- Single chimpanzee escapes into unsecure area outside the facility (i.e. outdoor visitor area)
- Multiple chimpanzees escape into unsecure area outside the facility (i.e. outdoor visitor area)
- Unknown number of chimpanzees escape into unknown area (i.e. missing chimpanzee(s))
- Chimpanzee(s) escape and breach zoo boundaries (i.e. involvement of local law enforcement)

These situations can be modeled by the use of volunteers posing as escaped chimpanzees. Such volunteers should be familiar with chimpanzee behavior to accurately model potential situations in real time. These "mock chimpanzees" should be clearly marked as such for the drill. All drills need to be recorded and evaluated to ensure that procedures are being followed, that staff training is effective, and that what is learned is used to correct and/or improve the emergency procedures. Records of these drills must be maintained and improvements in the procedures duly noted whenever such are identified (AZA Accreditation Standard 11.5.3).

If an animal attack occurs and injuries result from the incident, a written account outlining the cause of the incident, how the injury was handled, and a description of any resulting changes to either the safety procedures or the physical facility must be prepared and maintained for five years from the date of the incident (AZA Accreditation Standard 11.5.3).

Creating and maintaining a relationship with the local police force with jurisdiction in your immediate area is an important precautionary step. Working with these agencies to discuss possible scenarios, including if and when to take action and/or use lethal force can be very helpful.

Chapter 3. Transport

3.1 Preparations

Animal transportation must be conducted in a manner that adheres to all laws, is safe, and minimizes risk to the animal(s), employees, and general public (AZA Accreditation Standard 1.5.11). Safe chimpanzee transport entails the use of appropriate conveyance and equipment that is in good working order.

AZA Accreditation Standard

(1.5.11) Animal transportation must be conducted in a manner that is safe, well-planned and coordinated, and minimizes risk to the animal(s), employees, and general public. All applicable local, state, and federal laws must be adhered to.

Transport container: The size of the container should be related to the actual size of the chimpanzee for which the container is constructed. In general, it should allow the chimpanzee to stand, turn, and lie down in a natural manner. If forklift spacers are required, they should be 5 cm (2 in) thick, and should be provided when the total weight of the container and chimpanzee is more than 60 kg (132 lb).

Materials: Container materials that can be used for young great apes include wood (although this is not advisable for anything larger than small infants), metal, or wire mesh. For adult great apes, these materials include metal, welded mesh, and muslin or other light material. All materials should be non-toxic.

Frame: The container frame for young/sub-adult great apes should be made of strong materials that are bolted or screwed together; for adult great apes, welded metal lined with smooth wood or other similar material of a minimum thickness of 1.2 cm (0.5 in) is recommended. Additional strengthening braces should be present on the sides of the container when the total weight is more than 60 kg (132 lb). All inside edges should be smooth or rounded with no sharp projections, such as nails, on which the chimpanzee can injure itself.

Sides and front: The sides of the container for young/sub-adult great ape should be wood or metal. The front should consist of 2.5 cm (1 in) weld or chain link that should be attached to the frame with a steel strip (staples should not be used). Behind the mesh, 2 cm (4/5 in) bore steel tubes should be sunk into the top and bottom of the frame to a depth of approximately 2.5 cm (1 in), and at a distance of 7.5 cm (3 in) apart center to center. The distance between bars and mesh should be such that the animal cannot poke its fingers outside the container. A 2/3 solid panel with 1/3 mesh wire at its lower portion, and two 10 cm (4 in) observation openings in the upper part, should be placed in front of the weld mesh/chain link. The other three sides should be solid with ventilation openings. The ventilation openings should be small enough so that no part of the chimpanzee can protrude from the container, and they should be covered with a light material such as muslin.

For adult great apes, solid wood or lined metal is necessary. The front should consist of iron bars spaced in such a manner that the animals cannot push its arms through the bars. The bars should have a sheet of welded mesh fixed at a distance of 7.5 cm (3 in) in front of them. A wooden shutter with slots or holes for ventilation should cover the whole front in order to reduce the amount of light inside the container, as well as to reduce the disturbance to the animal, and to protect the handling personnel. The other three sides, one of which is the door, should be solid with ventilation openings.

Handling: For all apes, handling and spacer bars should be provided on three sides of the container.

Floor: For all apes, the base of the container should be solid and leak proof. A grill should be securely fixed and placed over a leak proof droppings tray to collect the excreta that falls onto it.

Roof: For all apes, the roof of the container should be solid, but with mesh ventilation openings.

Door: For young/sub-adult great apes, access into the container should be by a vertical sliding door at the back that extends the whole height of the container. It should be fastened with tamper proof fasteners or bolted shut after loading. A center batten should be provided across the whole width of the container, including the door, which is put in place after the door is closed.

For adult great apes, a sliding door the same height and made of the same material as the container should be placed in the rear of the container. It should have strong and secure means of fastening that cannot be opened accidentally.

Ventilation: For sub-adult great apes, mesh ventilation openings approximately 2.5 cm (1 in) in diameter should be provided along the base, in the upper 1/3 of the sides and rear, and on the top of the container. Whenever openings are covered by mesh, care should be taken that there are no sharp edges present within the container, and all edges should be covered with smooth material that is tamper proof. A muslin, or similar material, curtain should cover all ventilation openings including the front.

For adult great apes, mesh ventilation openings, approximately 2.5 cm (1 in) in diameter should be provided at heights that will give good ventilation at all levels but particularly when the animal is in a prone position. Openings should cover the sides, rear and top, as well as the sliding shutter. All openings can have exterior mesh screening. A muslin, or similar material, curtain should cover all ventilation openings including the front.

The equipment must provide for the adequate containment, life support, comfort, temperature control, food/water, and safety of the animal(s).

Number of people for transport: Three people are recommended for chimpanzee transport. Two of these people should be very familiar with the chimpanzee's personality and history (most likely a familiar animal keeper), and one of the three should be a veterinarian. This also creates an adequate number of people to rotate driving and monitoring duties. At least one person should be monitoring the chimpanzee (visually or via monitor) at all times. The driver should not have monitoring responsibility to ensure safe driving.

Chimpanzee transport supplies list:

- 2 gallons (7.6 liters) of water per chimp per 24 hour period
- Treats that will fit through bars/mesh of crate
- Produce
- Biscuits that will fit through bars/mesh of crate
- Juice
- Blankets
- Medications and med sheet
- Cups
- Pill crusher and pill splitter
- Emergency kit
- Vet box
- Soap/hand sanitizer
- Personal protective equipment (latex gloves, masks, tyvek suit)
- Baby monitor
- Thermometer to measure air temperature
- USDA transfer form
- Health certificate
- Health records
- State import permit
- Credit card/cash
- Road atlas
- Important phone numbers
- Vehicle registration and insurance card
- Cell phone car charger
- Extra vehicle keys
- Lug wrench and jack
- Spare tires for vehicle (and trailer if trailer used)
- Jumper cables
- Oil and coolant
- Ramp for onloading and offloading crate if necessary
- Emergency cooling/heating equipment
- >generator or battery with fan or heater
- >advisable not to transport chimpanzees for any distance in extreme temperatures or weather

Pre-shipment testing: See Chapter 6, section 6.3 for information on recommended medical tests to be performed on chimpanzees prior to shipment. A 'Certificate of Veterinary Inspection,' medical records, and appropriate permits should accompany any chimpanzee in transit.

Safe transport also calls for the assignment of an adequate number of appropriately trained personnel (by institution or contractor) who are equipped and prepared to handle contingencies and/or emergencies that may occur in the course of transport. Planning and coordination for animal transport requires good communication among all affected parties, plans for a variety of emergencies and contingencies that may arise, and timely execution of the transport. At no time should the animal(s) or people be subjected to unnecessary risk or danger. Transport protocols should be well defined and clear to all animal care staff.

Emergency situations during transport: Emergency situations may occur during transport such as:

- Two chimpanzees are crated together and one injures the other. See Section 3.2 for recommendations on number of animals per crate
- An overly sedated chimpanzee suffocates because of his position in crate and/or item in crate.

- A chimpanzee becomes extremely agitated during transport, and collapses and/or injures self.
- Vehicle develops mechanical problems/breaks down.

Preventing emergencies during transport: Chimpanzees being transported may be mildly sedated but should be able to lift their own heads before departing, and always during transport unless they are small and young enough to be safely physically moved if necessary for their own safety. Any chimpanzee that appears very agitated prior to transport should be considered a candidate for pre-sedation and continued mild sedation during transport. If the animal is unable to be calmed prior to leaving, consideration for delaying the transport should be given so that staff can reassess and develop another plan for moving that individual.

3.2 Protocols

Transport protocols should be well defined and clear to all animal care staff. Safe transport also calls for the assignment of an adequate number of appropriately trained personnel (by institution or contractor) who are equipped and prepared to handle contingencies and/or emergencies that may occur in the course of transport. At no time should the animal(s) or people be subjected to unnecessary risk or danger.

Food and water: For all apes, separate feed and water containers should be provided, either revolving or fixed. If fixed inside, the container they should be placed at a height that does not allow the chimpanzee to sit upon them, and there should be an outside access for filling and emptying that does not allow the chimpanzee any chance of escape. Water containers should be able to be filled safely and from the outside of the container.

Bedding and substrate: For all apes, the floor of the container should be covered with absorbent material, such as wood shavings, to the depth of at least 10-15 cm (4-6 in). The use of straw should be avoided, but bedding can be provided on the top of a leak-proof tray. If a grill or slatted floor is not suitable, there should be sufficient absorbent bedding material on the floor to absorb all of the excreta, and sills should then be used in the front and the rear of the container.

Temperature, light, and sound: Primates are affected by temperature change, and severely affected by temperature extremes. Care should be taken to ensure that they are not subjected to drafts. Most species can withstand reasonable variations in temperature, but exposure to wind or to a draft can be fatal. Therefore, consideration should be given not only to temperature changes, but also to the chill factors involved. Primates should also not be exposed to direct heat, such as direct sunlight or against hot radiators. Primates unavoidably subjected to extreme heat should be cooled with external fans (safely placed away from the container) or other cooling devices, such as air conditioners, to prevent dehydration or heat prostration.

During prolonged transit stops, when the ramp temperature exceeds approximately 20ºC (68ºF), the aircraft compartment doors should be opened and, in extreme temperatures, ground equipment should be used to ventilate the compartments. The different climatic factors prevailing during a journey should always be considered when arranging the routing and carriage of live primates.

The many unfamiliar environments encountered by a chimpanzee during shipping can cause stress, or cause the chimpanzee to become excited. In order to minimize outside stimulation, wooden slats or shutters with ventilation openings can be placed on the outside of the shipping container. Ventilation openings can also be covered with a light material such as muslin to reduce light levels.

Animal monitoring: The USDA requires that only one live chimpanzee can be transported in the same container with the following exceptions: a mother and her nursing young can be transported together; an established male/female pair, or a compatible pair of juveniles (AWR 2005). It is unadvisable to transport more than two chimpanzees in a single container. When this is attempted, careful consideration should be given to the relationship of the two chimpanzees.

Chimpanzees should be transported with a familiar caretaker or veterinarian. The USDA requires that chimpanzees in transit by ground be inspected as often as circumstances allow, but not less than once every four hours to make sure they have sufficient air for normal breathing, that the ambient temperature is within appropriate limits, and that all standards are being complied with (AWR 2005). During air transportation, chimpanzees should be inspected as often as circumstances allow, but not less than once every four hours if the animal cargo area is accessible during flight. If the cargo area is not accessible, the chimpanzee should be inspected whenever they are loaded or unloaded to make sure they have sufficient air for normal breathing, that the ambient temperature is within appropriate limits, and that all standards are being complied with. If the chimpanzee is obviously ill, injured, or in distress, it should not be transported in commerce except to receive medical attention for the condition.

Most transportation today can be accomplished within 24-96 hours. If delays occur, it is not always possible or feasible to move a chimpanzee to a temporary holding facility. Shifting a chimpanzee out of a shipping container and having to get it back in may be more stressful than leaving it in the shipping container and providing for its basic needs. If a known delay or layover of more than 72 hours is planned, and there is a convenient facility with appropriate veterinary and care staff available, then it may be beneficial to allow the chimpanzee access to temporary housing.

Post-transport release: Chimpanzees should be transported to the holding institution or quarantine facility as soon as possible after being offloaded at their destination. The Center for Disease Control (CDC) requires 90-day quarantine for chimpanzees coming into the United States. Appropriate arrangements should be made ahead of time with a facility licensed to handle CDC quarantines. Many facilities also require a quarantine period when accepting chimpanzees from other facilities. Appropriate quarantine facilities should be available upon the arrival of the chimpanzee. See Chapter 6, section 6.3 for additional information on quarantine recommendations.

4.1 Group Structure and Size

Careful consideration should be given to ensure that animal group structures and sizes meet the social, physical, and psychological well-being of those animals and facilitate species-appropriate behaviors.

Group structure: In the wild, the principal social organization of chimpanzees is reflected by highly fluid, fission/fusion societies made up of shifting associations of individuals within a relatively stable unit-group (Nishida 1968) or community (Goodall 1973), and whose 20 to over 100 members share a common home range. The community constitutes a relatively closed social network within which the fluid associations of individuals take place. A community typically has a dominant (alpha) male leader, and there are also power-wielding coalitions among both males and females. Underlying the level of the community, individuals come together to form temporary parties or bands that may stay together for a few minutes or days. The most stable long lasting party is the association between a mother and her dependent offspring, but these bands may include a great variety of structures, including all-male groups, all-female groups, males and females with or without juveniles and adolescents, etc. Chimpanzees are thought to be largely promiscuous, with several males following and mating with a female in estrus. In another mating strategy, a male may enter a short-term relationship with a receptive female and prevent other (lower-ranking) males from mating with her. Or an adult pair may establish a temporary, exclusive consortship for periods up to three months.

The AZA Chimpanzee SSP recommends the maintenance of social groups that contain multi-male groups with age and sex diversity. With appropriate staff and facilities, the recommended size of a social group should meet or exceed 3 adult males and 5 mature females and dependent offspring. Institutions are encouraged to house chimpanzees in multi-male/multi-female age stratified groups to resemble the wild population. By housing chimpanzees in larger groups with various age/sex classes, the opportunities to form, breakup, and reform parties of various sizes and compositions (a fundamental characteristic of the chimpanzee fission/fusion social structure) can be accomplished. This provides the chimpanzees in zoos and aquariums with opportunities to express behaviors closely associated with those various parties, and in a similar manner to their wild conspecifics (Fulk and Garland 1992).

Females: Females in the wild spend the majority of their time in small groups consisting of an adult female and her dependent offspring. They generally feed alone unless a particularly rich food patch attracts most of the community to a single place. *Pan troglodytes* females generally emigrate from their natal group, providing a means by which genetic diversity is maintained. Transfer usually occurs during adolescence, but has been observed to occur in adult females. Females may even switch back and forth between communities (Garland 1992).

Males: Housing several adult males together in zoos and aquariums can be a challenge (Bloomsmith and Baker 2001), not only due to their intense competition for status and its benefits in the community (Goodall 1973), but because females represent both the objects of competition as well as potential allies (Bloomsmith and Baker 2001). However, forming multi-male, mixed-sex groups will stimulate a wider variety of species-appropriate behaviors that may not be observed in groups containing only one male. In zoos and aquariums, males are in continual proximity, and have little need to ally against external threats (Bloomsmith and Baker 2001). Likewise, it has been shown that the presence of multiple adult males in the group acts to buffer some of the disruptive effects of adolescent males in the group (Ross et al. 2009).

In the wild, males show high levels of sociality and strong coalitionary bonds with each other (Bloomsmith and Baker 2001). There are significantly higher frequencies of affiliative relationships among males than among females. A dominance hierarchy and its associated social dynamics are most evident among males of a group. Males spend a great deal of time together, whether in feeding, patrolling, resting or in social grooming (Garland 1992). Males clearly prefer each other as social partners, particularly as grooming partners, as would be expected given their behavior in the wild (Fitch et al. 1989). From this standpoint, and in order to provide a social life to “excess” males, formation of all-male or multi-male groups is advisable (Bloomsmith and Baker 2001).

Single-sexed groups: Chimpanzees are best suited for mixed gender groups, however, forming all-male groups has proven to be a successful way of providing males that are not housed with females with the opportunity to form strong social bonds with other males, as is common among wild chimpanzees (Goodall 1986). All-male groups generally include males of similar age (juveniles or adolescents or adults) and body size. Successful male groups generally include individuals that have been socialized and are gregarious in their interactions with humans and chimpanzees, exhibit relatively low levels of abnormal behavior patterns, and exhibit low levels of aggression or fear of other chimpanzees (Fritz and Howell 2001). It is recommended that all-male groups be housed outside the sensory (visual and olfactory) range of females, if possible, to reduce the potential for aggression. There is no conclusive evidence to suggest a maximum number of adult males that can coexist with each other, nor are there good data on how these all-male groups differ behaviorally from mixed-sex groups. Additional research is needed to gather more evidence on this topic.

Group size: The size of a wild chimpanzee community is directly tied to habitat features such as density, forest type, and food availability. In general, the number of males and females in a wild group of chimpanzees is fairly even. However, the

sex ratio may vary among communities or even within a community. Community sizes can range from 20-100 individuals of all age classes. Boesch (1996) reviewed party size in different communities of wild chimpanzees and found that the average party size numbered 5.7 individuals (range from 4.0 to 8.3).

Zoos and aquariums should make every effort to house chimpanzees in social groups that reflect the social organization of groups found in the wild. Chimpanzee exhibits should consist of multi-male/multi-female social groups. The recommend size of newly established groups is 3 males and 5 females (Fulk 2001). The size of groups held in zoo and aquarium environments will vary from institution to institution, and may be limited not just by exhibit size, but also by the size and flexibility of the holding facilities. Chimpanzees should never be housed alone for any extended period of time unless it is deemed to be necessary for the physical or psychological well-being of that individual.

Changes in social behavior: Patterns of sociality may be affected by daily factors such as the estrus condition of females. Generally, females exhibiting estrus swellings elicit greater social attention, and may also influence intra-group competition between males. Likewise, there may be some differences in behavior based on increasing age, such as decreased play and decreased activity.

Adolescence, specifically, is a time of important social change. As individuals move into sexual maturity, they spend less time with their mothers and more time with other members of their group. Females exhibit their first swellings and undergo social changes described above. Males may begin exhibiting “pestering” behavior that serves to explore their place in the social hierarchy. Despite these known behavioral patterns, a study of adolescent male chimpanzees in AZA-accredited zoos found no differences in wounding levels between those groups housing adolescent males and those without adolescent males (Ross et al. 2009).

4.2 Influence of Others and Conspecifics

Animals cared for by AZA-accredited zoos and aquariums are often found residing with other animals of their species but may also be found residing with conspecifics. The presence of neighboring groups of conspecifics may influence the behavior of chimpanzees in zoos and aquariums. Data from laboratory-housed chimpanzees suggest that vocalizations, displays, and agonistic behavior increased when levels of vocalizations from neighboring individuals were high (Baker and Aureli 1996). Similarly, Videan et al. (2005) found that agonistic noises and vocalizations from neighboring social groups increased rates of display behavior, and also that there was a significant relationship between grooming behavior and grooming vocalizations between neighbors. Care should be taken to monitor carefully the behavior of chimpanzees housed in facilities where they can see or hear other groups of chimpanzees.

Mixed-species enclosures: Chimpanzees have not been purposefully kept in mixed-species exhibits. Given their omnivorous and aggressive nature, it is not surprising that that there are multiple accounts of chimpanzees killing other species that happen to enter their exhibit area -- such as squirrels, rabbits, birds, and rats (Ross et al., 2009). There are also accounts of chimpanzees coexisting with some indigenous species such as turtles and fish. One exception to this was the use of a canine companion for nursery-reared infant chimpanzees (Thompson et al. 1991). Although the dog’s presence seemed to have a largely positive effect on the infant’s behavior in this study, there are few long-term data on the effects of this form of alternative rearing strategy. Currently, mixed-species enclosures are not recommended for chimpanzees.

4.3 Introductions and Reintroductions

Managed care for and reproduction of animals housed in AZA-accredited zoos and aquariums are dynamic processes. Animals born in or moved between and within institutions require introduction and sometimes reintroductions to other animals. It is important that all introductions are conducted in a manner that is safe for all animals and humans involved.

Introductions: Flexibility on the part of the keepers and the management staff should be an integral part of any introduction plan. Planning meetings held prior to the introduction process should include members of the zoo’s management staff, caregivers, researchers, veterinarians, maintenance personnel, and public relations staff. The method of introduction should be discussed thoroughly, including alternative plans of action (McNary 1992).

Introduction methods and the process of social group formation should begin with an assessment of an individual’s background, behavioral experience and characteristics, baseline behavior observations, and behavioral records (Fritz and Howell 2001). The personalities, ages, and social experiences of each chimpanzee, and their reactions to new situations, will be different. Some chimpanzees will not have had the benefit of being raised by their mothers in large social groupings, and others may have spent their early years in a nursery, a circus, or a private home, limiting their social experience (McNary 1992).

During the introduction process, constant monitoring of each chimpanzee’s behavior, either normal or abnormal, is critical. Aberrant behaviors may develop or be accentuated by the introduction. Anxiety can be displayed in a variety of ways, including stereotypic movements, exaggerated scratching, fear grins, diarrhea, excessive hair plucking, obvious agitation, or withdrawal. Although such behaviors may decrease in frequency as the group begins to settle, they are a timely reminder that an individual chimpanzee may be having difficulty adjusting to this new situation. Each step of the

introduction should be evaluated carefully to assess the psychological and physical status of each chimpanzee (McNary 1992).

Introduction protocols: While introductions may vary in duration, the "typical" introduction procedure can be described as follows. The animals to be introduced should be given an opportunity to see each other, after which they can be provided with limited protected contact through a mesh barrier. Once affiliative behaviors, dominance/subordinance behaviors, and/or reductions in aggressive gestures are observed, managers can allow individuals into the same enclosure. Often, when a large group is being formed, different combinations of the unfamiliar animals are introduced before the large group is housed together (Bloomsmith and Baker 2001). Giving all individuals access to unfamiliar enclosures before the introduction process begins may aid the introduction. Alternatively, a novel environment to all group members can actually help reduce territorial behavior – the key element is to avoid giving one party an advantage over another. It is important to note that agonistic behavior ranging from displays (mild and boisterous) to aggression (mild to severe) is very common during the introduction process. However, it is equally important to note that most introductions are eventually successful (Fritz and Howell 2001).

The AZA Chimpanzee SSP advocates a restricted intervention strategy in which human caregivers minimize their interference in the hierarchy reformation process during introductions. This strategy is relevant during day-to-day management of the chimpanzees, but is especially important during the social introduction process. The following information on minimum intervention management strategies has been adopted from the Australasian Species Management Program (2005). One of the keys to successful management of a large multi male/multi female group is allowing hierarchical disputes to run their natural course (as far as possible) without intervention from animal management staff. This style of management is referred to as 'restricted intervention' and the main points are outlined below:

- Multi-male groups are fundamental to chimpanzee social structure. There are more interactions between males in a chimpanzee group (both aggressive and grooming interactions) than between females or between males and females.
- Male social hierarchy disputes are resolved by many means, including affiliative behaviors (e.g., grooming), and agonistic behaviors such as displays and physical aggression (e.g., fighting). Males are responsible for most of this aggression, but females may also become involved (Boehm 1992).
- Fighting is often robust, and injuries ranging from minor scratches to serious wounds can occur. In the wild, male chimpanzees tend to stay with the group even following unsuccessful challenges to the alpha-male. Likewise, former alpha-males usually remain with the group even if deposed. It is not necessary to separate chimpanzees just because there is a power struggle.
- If keepers intervene too early, hierarchy issues are not resolved, and aggressive encounters are repeated. Aggressive encounters should be seen as an integral part of chimpanzee society.
- The policy of minimal intervention will require some fortitude on behalf of the animal managers. Serious injuries might be minimized by appropriate enrichment, complex housing, and the application of positive reinforcement training regimens. It is important for all staff members to understand that there will likely be injuries in chimpanzee groups.
- Fighting should be monitored and evaluated as it occurs. No protocols will cover all contingencies. It some cases, intervention will be necessary and appropriate, but care should be taken not to intervene unnecessarily. Consultation with managers and scientists experienced in conducting social introductions and managing established groups is always advisable to help determine where to draw the line in terms of interventions.

It is important to allow individual chimpanzees sufficient time to acclimate to new social partners. The process may take time, particularly for fearful chimpanzees, or those with limited social experience. Groups generally become stabilized within seven days, and establish social relationships within two weeks (Fritz and Howell 2001). During the period of stabilization, the AZA Chimpanzee SSP recommends that the group is kept together continuously, whenever possible, and not separated and reformed on a regular basis. Individuals may continue to show high levels of excitement if they are temporarily separated and re-introduced, and exhibit fear and aggression during times when the group is excited (e.g., just prior to feeding). Once social relationships are established and group members form social bonds and establish dominance hierarchies, fear and aggression are only occasionally observed in compatible social groups (Fritz and Howell 2001).

Management of introductions: Positive reinforcement training has not been tested during chimpanzee introductions (Bloomsmith and Baker 2001), but has proven to be an effective method for training chimpanzees for both routine and non-routine husbandry procedures (see Chapter 8 section 8.1 for additional information). Procedures outlined by McNary (1992) that have been useful in facilitating introductions include:

- Allowing the new chimpanzees time to explore and become familiar with any new area in the absence of unfamiliar conspecifics.
- Allowing the chimpanzees to have visual access to each other (e.g., through plexi-glass barriers, nearby holding areas, or possibly even mirrors).

- Allowing the chimpanzees tactile access to each other in a manner that allows touching and smelling, without the animals being able to bite or grab (e.g., through heavy wire mesh installed between two adjacent holding areas).
- Allowing the chimpanzees' physical access to each other.

Group formation may be accomplished in several ways, depending on the exhibit and holding area capabilities, and the chimpanzees involved. These include:

- Slowly adding individuals to a core group.
- Expanding the one-on-one introduction process to include more individuals.
- Introducing two or more smaller groups to each other.
- Quickly introducing all of the chimpanzees together after they have gone through the initial introduction phase. In some introductions of this type, a mild sedative has been given to the chimpanzees in the group in hopes of minimizing aggression. This has been done with mixed results and is not recommended.

The use of various enrichment items, browse, and low-value scattered food (e.g., cereal) may help to dissipate aggression by keeping the chimpanzees occupied. Feeding the chimpanzees prior to the introduction may also help them feel more relaxed. However, if a serious injury occurs during the introductions that requires immediate medical attention, there is an increased risk for chimpanzees that have recently eaten if anesthesia is needed. Equipment that may be useful during an introduction includes a water hose with a high power nozzle, and a CO_2 fire extinguisher to distract an individual long enough for another to escape, or as a deterrent (Fritz and Howell 2001).

5.1 Nutritional Requirements

> **AZA Accreditation Standard**
>
> **(2.6.2)** A formal nutrition program is recommended to meet the behavioral and nutritional needs of all species and specimens within the collection.

A formal nutrition program is recommended to meet the behavioral and nutritional needs of all animals (AZA Accreditation Standard 2.6.2). Diets should be developed using the recommendations of Nutrition Advisory Groups (www.nagonline.net/feeding_guidelines.htm), AZA Taxon Advisory Groups (TAGs), Species Survival Plan® (SSPs) Programs, as well as veterinarians. Diet formulation criteria should address the animal's nutritional needs, feeding ecology, as well as individual and natural histories to ensure that species-specific feeding patterns and behaviors are stimulated.

Although daily human caloric needs can be a guide for chimpanzees, NRC guidelines were published recently for non-human primates (NRC 2003). More research is needed to identify specific nutrient requirements for chimpanzees.

Nutritional needs: As complete diets provided to chimpanzees (see section 5.2) should be balanced for vitamins and minerals, routine supplementation is not generally necessary, although non-human primates have a dietary requirement for vitamin C. Where supplementation is provided, human products can be used by label direction. However, selection of products without excess iron (i.e., greatly exceeding the 2003 NRC guidelines) is important unless iron-deficiency anemia is specifically under treatment.

Vitamin D: In juveniles, documented cases of vitamin D deficiency (metabolic bone disease) have occurred in chimpanzees housed exclusively indoors. Vitamin D requirements can be met with an appropriate diet and/or UVB exposure, which may include routine outdoor access. When this is not possible due to exhibit design or season, appropriate supplementation of calcium and vitamin D is essential.

Pregnant females: Pregnant females may benefit from adjustments in their diet; however, there are no definitive data to guide these changes. Managers might consult guidelines that address dietary requirements for pregnant humans – such as adding prenatal vitamins to best meet their needs for folic acid and iron. Caloric intake may be increased during pregnancy (last trimester only) and lactation.

Seasonal changes: There are no definitive data to support the requirement to change the composition of diets based on seasonal changes. Care should be taken to ensure that sufficient vitamin D is being provided during extended indoor living that might result from cold winter conditions in northern climates.

Target ranges of nutrients for all life stages: This information is available in Nutrient Requirements of Nonhuman Primates, Second Revised Edition, 2003 published by the National Research Council.

Energy requirement calculations: The maintenance energy requirement (MER) is the amount of energy used by an animal in a thermoneutral environment, that is, at the optimal ambient temperature. It represents the energy expended in obtaining and using food in an amount sufficient to maintain body weight, but not to support growth, pregnancy or lactation. It is important to remember that the calculated MER only represents an estimate of energy need. To calculate the MER of a given individual, body weight in kg should be raised to the 0.75th power and then the resulting value multiplied by 100 to estimate total kcal needed per day. For chimpanzees weighing approximately 76.5 kg (168.7 lb), this results in 1800 to 2600 kcal per day, depending on conditions (NRC, 2003; page 45). The result is the approximate energy expenditure of a mature individual in a day and can be used to estimate diets and nutritional needs.

5.2 Diets

> **AZA Accreditation Standard**
>
> **(2.6.3)** Animal diets must be of a quality and quantity suitable for each animal's nutritional and psychological needs. Diet formulations and records of analysis of appropriate feed items should be maintained and may be examined by the Visiting Committee. Animal food, especially seafood products, should be purchased from reliable sources that are sustainable and/or well managed.

The formulation, preparation, and delivery of all diets must be of a quality and quantity suitable to meet the animal's psychological and behavioral needs (AZA Accreditation Standard 2.6.3). Food should be purchased from reliable, sustainable and well-managed sources. The nutritional analysis of the food should be regularly tested and recorded.

Sample diets: In the wild, chimpanzees primarily eat fruit, but their diets also include leaves, pith, seeds, flowers, insects, and meat (Wrangham 1977; Goodall 1986). Insects and meat make up between 1-5% of the diet. Although chimpanzees in zoos and aquariums receive enough protein in the form of commercial primate diets, the amount of complex carbohydrates and fiber in their diets is generally less than wild chimpanzees (Pruetz and McGrew 2001). While the variety of food types found in the diet of the wild chimpanzee is not likely to be matched by chimpanzees in zoos and aquariums, some attempt should be made to give chimpanzees in zoos and aquariums varied food types that resemble the diet of wild chimpanzees as much as possible (Pruetz and McGrew 2001).

Chimpanzees should be fed a balanced diet that includes a mixture of vegetables, fruits, and nutritionally complete dry food. A good quality complete food (biscuits) with mixed produce (vegetables, fruits, greens) will compose the base diet, with minimal or no dairy and additional protein sources provided. Providing a supply of browse is important whenever possible by seasonal availability.

A staple portion of the chimpanzee diet should be a 15-25% protein monkey biscuit with low calories (<3 kcal/g if possible), high fiber (10-12%), and low fat (3-4%). In addition, a variety of other foods should also be provided throughout the day at frequent intervals for enrichment, and to enhance nutrition (Lee and Guhad 2001). Foraging and eating account for the largest proportion of a chimpanzee's daytime activity in the wild. Chimpanzees at Gombe eat during 47-60% of their waking day (Wrangham 1977), and at Tai, chimpanzees eat for an average of 54% of their waking time (Boesch and Boesch 2000). In contrast, adult females in mixed parties at Mahale spend only 30% of their time foraging and eating (Matsumoto-Oda et al. 1998), perhaps indicating increased feeding competition in mixed parties, or replacement of eating with other activities such as socio-sexual behavior (Pruetz and McGrew 2001).

The nutritional status of chimpanzees also influences many aspects of their health and behavior. Nutritional requirements may vary depending on the individual's health, growth stage, activity, immune status, or housing conditions. An approximation of chimpanzee nutritional requirements can be developed using human RDA and Nonhuman Primate NRC tables (2003), however, these should be considered rough estimates because a chimpanzee's diet in the wild is much higher in fiber. Dietary fiber levels for chimpanzees in zoos and aquariums are important, and overall levels provided may need to be increased. This can be accomplished in several ways:

- Offering all fruits raw and unpeeled, as fiber is often localized in the peels.
- Replacing soft fruits (e.g., bananas, grapes, citrus fruits), which contain low fiber levels, with hard fruits (e.g., apples, pears) or vegetables (e.g., yams, potatoes, squash), which contain relatively more fiber. Overall, the fiber content of fresh produce is low. The most efficient way to increase fiber intake is to feed a high fiber biscuit (see Milton and Demment 1988).
- Increasing green produce in the diet, and/or adding browse on a daily basis.
- Provision of hay, steel cut oatmeal, beet pulp, corn husks, and/or banana leaves.

Fruits are an important diet component for chimpanzees in the wild and in zoos and aquariums, and may provide valuable behavioral stimulation. The domesticated fruits fed in zoos and aquariums contain more simple sugars and less fiber, but similar available protein levels, than fruits obtained in natural habitats. A variety of fresh fruits should be offered, with choice dictated by local or seasonal availability, and with price a major consideration. Fruit should not exceed 25% of the total weight of the diet, and may even contribute much less, providing approximately 5% of the dry matter. Greens in the form of locally available browse plants, or dark green leafy produce (iceberg lettuce is acceptable but is not as good a source of nutrients) should be offered in amounts up to 45-50% (as fed basis) of the total diet. Palatable forage plants can even be incorporated into exhibits to allow natural foraging activity. Increased greens would also provide natural sources of dietary fiber, protein, calcium, B vitamins, beta-carotene, and alpha-tocopherol (vitamin E). All diet ingredients as consumed should meet the suggested guidelines in the Nonhuman NRC (2003). The following table (Table 3) lists the percentage fiber of various fruits and vegetables according to the USDA database:

Table 3: The fiber content of select fruits and vegetables based on 100g of each item (fresh weight).

Food item	% Fiber content (fresh weight)
Bananas (no peel)	2.6
Oranges (no peel)	2.4
Oranges (with peel)	4.5
Apples	2.4
Pears	3.1
Grapes	0.9
Yams	4.1
Potatoes	2.2
Winter squash	1.5
Summer squash	1.1

Of additional interest is replicating wild chimpanzees' interest in pith. In the wild, when available chimpanzees spend the late afternoon sitting in a patch of elephant grass, stripping off the outer cover of the stems (approximately the size of sugar cane) and eating the relatively soft pith or core. More research is needed to determine how these food choices can be replicated in zoo environments (i.e. fresh corn stalks, sugar cane).

Feeding schedule: Since the predominant daytime activity of wild chimpanzees is searching for and consuming food, great effort should be made to increase the amount of time that chimpanzees in zoos and aquariums spend in similar endeavors. The presentation of food is an obvious form of enrichment, and can help increase foraging time and decrease aggression and abnormal behavior (Bloomsmith et al. 1988). Recommended feeding schedules should include multiple feedings throughout the day of a wide variety of food. Seeking, processing, and ingesting food are vital components of chimpanzee daily life, and so variability in food type and presentation should be a primary goal within chimpanzee management programs in zoos and aquariums.

Food variety and presentation: The diet of wild chimpanzees includes fruits, leaves, pith, blossoms, seeds, stems, bark, resin, honey, insects, eggs, and meat. Food intake varies by season, consisting on an annual basis of about 60% fruits, 30% vegetation, and 5 - 10% animal matter. Termites are the most frequently consumed animals, but chimpanzees also stalk, kill, and eat young hoofstock, baboons, and other monkeys. Although providing live prey is not desirable in zoos and aquariums, a wide range of food items can be provided to chimpanzees as long as the nutritional composition of the total diet is known.

Encouraging species-appropriate foraging has been a recognized aim of most enrichment programs. For example, Bloomsmith and Lambeth (1995) used an unpredictable feeding schedule to reduce inactivity and abnormal behavior in chimpanzees in zoos and aquariums. Taking into account the varied aspects typical of eating and foraging by wild chimpanzees, such as the number and time of feeding bouts per day, can enhance eating and foraging and reduce inactivity and excessive caloric intake in zoo and aquarium animals (Pruetz and McGrew 2001).

The way that food is presented is an obvious a form of enrichment. Bloomsmith et al. (1988) found that aggression and abnormal behaviors declined significantly when four feeding regimes were simultaneously implemented with chimpanzees:

- Monkey biscuits *ad libitum*
- Presentation of foods with high process time (e.g., corn on the cob, celery, artichokes, sugar cane).
- Foraging foods (e.g., popcorn, sunflower seeds, peanuts) distributed over a grass substrate.
- Availability of food in a puzzle feeder.

Providing foods that require processing was found to be the most successful technique for eliciting long feeding bouts. Providing a variety of manipulatable objects to chimpanzees in zoos and aquariums both increases the amount of time spent in foraging-type activities and increases their well-being (Mellen and Shepherdson 1992). Designing structures that allow the chimpanzees to climb to obtain food may mimic foraging in the trees; for example, fruits suspended from climbing structures and varied seasonally to mimic seasonal fruiting of wild plants in the rain forest (Coe et al. 2001). The addition of browse encourages processing and consumption of food items. Damen (1990) found that the addition of browse increased foraging time from 3 - 17%, and resulted in a drastic decline in coprophagia. The provision of feeding opportunities such as browse, puzzle feeders, and termite mounds, may increase the potential for competition and conflict, but these situations can be managed by providing multiple sites for food acquisition.

Puzzle feeders: Wild chimpanzees, especially adult females, make use of tools to acquire termites (Goodall 1986). This predisposition has been used extensively in the development of artificial termite mounds and puzzle feeders for chimpanzees in zoos and aquariums. In an evaluation of tool use, Nash (1982) found that the presence of an artificial termite mound stimulated the exhibition of these wild behaviors, and that the termite mound was most often utilized by younger chimpanzees. Similarly, Brent and Eichberg (1991) found that the presence of a puzzle feeder decreased aggression, affiliative, inactive, and self-directed behaviors; in this study, females used the puzzle boards more than males. Maki et al. (1989) found that chimpanzees showed a significant decrease in abnormal behavior and inactivity in the

presence of termite fishing feeders. The provision of multiple feeders to preclude aggressive competition, and the use of different types of feeders to cater to individual task preference, are recommended. Maple and Finlay (1989) provide a review of a variety of puzzle feeders. The type of foods available in termite mounds/puzzle feeders should also be varied (Mellen and Shepherdson 1992), and a variety of novel food items have been offered, including barbecue sauce, jellies, syrup, honey, applesauce, oatmeal, and various condiments. The ability to easily access and clean a device such as an artificial termite mound should be considered in its design. The dental health impact of the foodstuffs chosen should also be considered, as well as their caloric content, which should be included in the overall nutrient evaluation of the diet. Please contact the AZA Chimpanzee SSP Coordinator for more information on specific food companies for primate diets.

Current diets and schedules:
Diets should be tailored to meet individual's needs. Lactating, pregnant, and geriatric chimps may have different nutritional needs than others. Diet changes should be made and assessed according to each chimpanzee's needs, consumption and behavior.

Nutrient analysis comparing to target nutrient ranges:
Any listed diet examples should be analyzed for nutrient composition; diets are not officially endorsed, but rather have been successfully implemented, by the AZA Chimpanzee SSP.

Food preparation must be performed in accordance with all relevant federal, state, or local regulations (AZA Accreditation Standard 2.6.1). Meat processed on site must be processed following all USDA standards. When preparing food for chimpanzees, one should not mix produce utensils and equipment with meat utensils and equipment. The shelf life of primate biscuits is limited to 6 months from the date of manufacture due to the loss of Vitamin C in the product.

If browse plants are used within the animal's diet or for enrichment, all plants must be identified and assessed for safety. The responsibility for approval of plants and oversight of the program should be assigned to at least one qualified individual (AZA Accreditation Standard 2.6.4). The program should identify if the plants have been treated with any chemicals or near any point sources of pollution and if the plants are safe for the species. If animals have access to plants in and around their exhibits, there should be a staff member responsible for ensuring that toxic plants are not available.

AZA Accreditation Standard

(2.6.1) Animal food preparations must meet all local, state/provincial, and federal regulations.

AZA Accreditation Standard

(2.6.4) The institution should assign at least one person to oversee appropriate browse material for the collection.

Browse plants: The Association of Zoological Horticulture (www.azh.org) has a searchable database of acceptable browse species. If plants are considered toxic to pets, it is safe to assume that chimpanzees should not consume them either. The American Society for Prevention of Cruelty to Animals website, maintains a list of plant species that are toxic to dogs and cats (www.aspca.org/pet-care/poison-control/plants/). The Humane Society of the United States also has a comprehensive list of poisonous plants on their website: (www.hsus.org/pets/pet_care/protect_your_pet_from_common_household_dangers/common_poisonous_plants.html). Also consult Burrows and Tyrl (2006) for a complete overview of poisonous plants.

Chemical sprays or pollution: All plant species offered to chimpanzees or grown in their enclosure should be free of chemical sprays such as herbicides, pesticides, and insecticides. If there is any doubt about the presence or previous presence of these types of chemicals the plant should not be offered. All plants that are determined to be free of chemical contamination should always be thoroughly rinsed with clean water before offering to chimpanzees

5.3 Nutritional Evaluations

Body size evaluations: The degree of variation in body size of chimpanzees is relatively small once factors of sex, age, and health (e.g., obesity) are removed. As a result, there are no conclusive dietary recommendations for chimpanzees of different size. Further research will help clarify this issue.

Health issues: For adults, obesity is a substantial risk factor for cardiac disease, and is inconsistent with good long-term health. It is important to include calories obtained from enrichment and operant conditioning sources as part of the balanced diet. Judicious use of sugar free or low sugar products will assist in maintaining appropriate weight and body condition. Regular weighing (e.g., several times yearly) is critical to long-term nutritional maintenance and weight loss when indicated. Foods high in sodium and fat are linked to cardiac disease in humans, and a similar relationship can be expected in chimpanzees. Poor diet can also be a contributing factor in the development of diabetes, and there are several reported cases of diabetic chimpanzees that require substantial health and diet management, including regular insulin injections. Consultation with a clinical nutrition (veterinary or human) specialist will provide guidance in these specific cases, and positive reinforcement techniques can be used to reliably obtain blood and urine samples to monitor glucose levels (Laule et al. 1996).

Tools and methods used for clinical nutritional evaluation: Evaluate body condition using numerical scale; body weight; evaluate individual's diet consumption to ensure that a balanced diet is being taken and that the chimpanzee is not being selective.

6.1 Veterinary Services

Veterinary services are a vital component of excellent animal care practices. A full-time staff veterinarian is recommended, however, in cases where this is not practical, a consulting/part-time veterinarian must be under contract to make at least twice monthly inspections of the animal collection and to any emergencies (AZA Accreditation Standard 2.1.1). Veterinary coverage must also be available at all times so that any indications of disease, injury, or stress may be responded to in a timely manner (AZA Accreditation Standard 2.1.2). All AZA-accredited zoos and aquariums should adopt the guidelines for medical programs developed by the American Association of Zoo Veterinarians (AAZV): www.aazv.org/associations/6442files/zoo_aquarium_vet_med_guidelines.pdf.

Veterinary drugs: Protocols for the use and security of drugs used for veterinary purposes must be formally written and available to animal care staff (AZA Accreditation Standard 2.2.1). Procedures should include, but are not limited to: a list of persons authorized to administer animal drugs, situations in which they are to be utilized, location of animal drugs and those persons with access to them, and emergency procedures in the event of accidental human exposure.

Continued work is needed to compile a comprehensive list of drugs commonly used for chimpanzee care and management, including storage, administration and hazards of all possible pharmaceutical interventions. Working with the sanctuary and laboratory communities, the AZA Chimpanzee SSP is working to compile this information for future use.

Animal recordkeeping is an important element of animal care and ensures that information about individual animals and their treatment is always available. A designated staff member should be responsible for maintaining an animal record keeping system and for conveying relevant laws and regulations to the animal care staff AZA Accreditation Standard 1.4.6). Recordkeeping must be accurate and documented on a daily basis (AZA Accreditation Standard 1.4.7). Complete and up-to-date animal records must be duplicated and retained in a fireproof container within the institution (AZA Accreditation Standard 1.4.5) as well as be duplicated and stored at a separate location (AZA Accreditation Standard 1.4.4). Each institution should refer to and adhere to institutional guidelines for recordkeeping and management and maintain a working knowledge of all relevant laws and regulations for your area.

6.2 Identification Methods

Ensuring that animals are identifiable through various means increases the ability to care for individuals more effectively. Animals must be identifiable and have corresponding ID numbers whenever practical, or a means for accurately maintaining animal records must be identified if individual identifications are not practical (AZA Accreditation Standard 1.4.3).

AZA member institutions must inventory their population at least annually and document all animal acquisitions and dispositions (AZA Accreditation Standard 1.4.1). Transaction forms help document that potential recipients or providers of the animals should adhere to the AZA Code of Professional Ethics, the AZA Acquisition/Disposition Policy (see Appendix B), and all relevant AZA and member policies, procedures and guidelines. In addition, transaction forms must insist on compliance with the applicable laws and regulations of local, state, federal and international authorities. All AZA-accredited zoos and aquariums must abide by the AZA Acquisition and Disposition policy (Appendix B) and the long-term welfare of animals should be considered in all acquisition and disposition decisions. All species owned by an AZA institution must be listed on the inventory, including those animals on loan to and from the institution (AZA Accreditation Standard 1.4.2). The Regional Studbook for chimpanzees uses three primary identifiers: (a) Studbook number: assigned by the Studbook Keeper; local ID number (assigned by the holding institution; and (c) House name. Only the first of these three is

AZA Accreditation Standard

(2.1.1) A full-time staff veterinarian is recommended. However, the Commission realizes that in some cases such is not practical. In those cases, a consulting/part-time veterinarian must be under contract to make at least twice monthly inspections of the animal collection and respond as soon as possible to any emergencies. The Commission also recognizes that certain collections, because of their size and/or nature, may require different considerations in veterinary care.

AZA Accreditation Standard

(2.1.2) So that indications of disease, injury, or stress may be dealt with promptly, veterinary coverage must be available to the animal collection 24 hours a day, 7 days a week.

AZA Accreditation Standard

(2.2.1) Written, formal procedures must be available to the animal care staff for the use of animal drugs for veterinary purposes and appropriate security of the drugs must be provided.

AZA Accreditation Standard

(1.4.6) A staff member must be designated as being responsible for the institution's animal record-keeping system. That person must be charged with establishing and maintaining the institution's animal records, as well as with keeping all animal care staff members apprised of relevant laws and regulations regarding the institution's animal collection.

AZA Accreditation Standard

(1.4.7) Animal records must be kept current, and data must be logged daily.

AZA Accreditation Standard

(1.4.5) At least one set of the institution's historical animal records must be stored and protected. Those records should include permits, titles, declaration forms, and other pertinent information.

AZA Accreditation Standard

(1.4.4) Animal records, whether in electronic or paper form, including health records, must be duplicated and stored in a separate location.

AZA Accreditation Standard

(1.4.3) Animals must be identifiable, whenever practical, and have corresponding ID numbers. For animals maintained in colonies or other animals not considered readily identifiable, the institution must provide a statement explaining how record keeping is maintained.

assured to be consistent through the lifetime of the chimpanzees and as such, is the most reliable method of identification.

AZA Accreditation Standard

(1.4.1) An animal inventory must be compiled at least once a year and include data regarding acquisitions and dispositions in the animal collection.

AZA Accreditation Standard

(1.4.2) All species owned by the institution must be listed on the inventory, including those animals on loan to and from the institution. In both cases, notations should be made on the inventory.

6.3 Transfer Examination and Diagnostic Testing Recommendations

The transfer of chimpanzees between AZA-accredited zoos and aquariums or Certified Related Facilities (CRFs) due to SSP recommendations occurs often as part of a concerted effort to preserve these species. These transfers should be done as altruistically as possible and the costs associated with specific examination and diagnostic testing for determining the health of these animals should be considered.

Quarantine facilities must be able to safely house chimpanzee(s) for the duration of their quarantine period. All safety and health requirements of regular housing must be maintained in quarantine quarters, but because of the short-term duration of a chimpanzee's stay, the available space may be smaller. As such, extra attention should be paid to creating a stimulating environment for the chimpanzee especially if that individual is housed alone. In some cases, when appropriate and safe quarantine facilities are not available at the receiving institutions, quarantine may be conducted at a nearby institution with appropriate coordination of the veterinary staffs of the sending, receiving and intermediary facilities.

6.4 Quarantine

AZA institutions must have holding facilities or procedures for the quarantine of newly arrived animals and isolation facilities or procedures for the treatment of sick/injured animals (AZA Accreditation Standard 2.7.1). All quarantine, hospital, and isolation areas should be in compliance with AZA standards/guidelines (2.7.3; Appendix C). All quarantine procedures should be supervised by a veterinarian, formally written and available to staff working with quarantined animals (AZA Accreditation Standard 2.7.2). If a specific quarantine facility is not present, then newly acquired animals should be kept separate from the established collection to prohibit physical contact, prevent disease transmission, and avoid aerosol and drainage contamination. If the receiving institution lacks appropriate facilities for quarantine, pre-shipment quarantine at an AZA or AALAS accredited institution may be applicable. Local, state, or federal regulations that are more stringent than AZA Standards and recommendation have precedence.

AZA Accreditation Standard

(2.7.1) The institution must have holding facilities or procedures for the quarantine of newly arrived animals and isolation facilities or procedures for the treatment of sick/injured animals.

AZA Accreditation Standard

(2.7.3) Quarantine, hospital, and isolation areas should be in compliance with standards or guidelines adopted by the AZA.

AZA Accreditation Standard

(2.7.2) Written, formal procedures for quarantine must be available and familiar to all staff working with quarantined animals.

AZA institutions must have zoonotic disease prevention procedures and training protocols established to minimize the risk of transferable diseases (AZA Accreditation Standard 11.1.2) with all animals, including those newly acquired in quarantine. Keepers should be designated to care only for quarantined animals if possible. If keepers must care for both quarantined and resident animals of the same class, they should care for the quarantined animals only after caring for the resident animals. Equipment used to feed, care for, and enrich animals in quarantine should be used only with these animals. If this is not possible, then all items must be appropriately disinfected, as designated by the veterinarian supervising quarantine before use with resident animals.

AZA Accreditation Standard

(11.1.2) Training and procedures must be in place regarding zoonotic diseases.

Quarantine protocols: The purpose of quarantine is protection of the existing animals and their personnel from the introduction of infectious agents from the newly arriving animal(s). The quarantine period (30-60 days) is accomplished by separation of the new animals from the existing group, and screening them for known diseases. The depth of this screening will vary with the previous history of the individual animal and its collection source. In situations where minimal prior screening has been accomplished, it is important to consider longer quarantine intervals (60-90 days), and for those animals from private facilities or the wild, this extension is mandatory (in imported animals), and can be increased to 90-120 days. If additional mammals of the same order are introduced into the chimpanzee quarantine area, the minimum quarantine period must begin over again. However, the addition of mammals of a different order to those already in quarantine will not require the re-initiation of the quarantine period. Increased attention to enrichment is necessary when chimpanzees are housed singly during quarantine periods of any length (see section 6.6 for additional information).

As part of the quarantine evaluation, the group that the quarantined animal will enter should have known status for the infectious agents of concern. This is managed through routine physical examinations and documented in their medical history. For the new animal, quarantine begins with a thorough review of the medical records and social history of the individual, its source group, and collection history. Medical records for each animal should be accurately maintained and easily available during the quarantine period. Prior to departure from the sending institution, the chimpanzee should receive a complete examination (see Table 4) that should also be reviewed by the receiving institution veterinarian and

curator before departure. Within two weeks of arrival at the new facility, the chimpanzee should be immobilized for a repeated physical examination (see Table 4). When parasites are identified by fecal flotation, appropriate treatment regimens should be prescribed. A combination of the pre-shipment and quarantine examinations provide the minimum of two physical examinations during this period. However, longer quarantine intervals will include repeated examinations every 3-4 weeks.

Table 4: Recommended annual/quarantine physical examination for chimpanzees

Procedure	Notes
Physical examination	Including a systemic evaluation using tools to extend senses of examiner as needed
Dental examination	Including necessary prophylaxis
Accurate weight	---
Blood collection	- CBC, chemistry panel, blood typing, viral serology, serum banking (all ages) - Thyroid panel for adults (>15 years) - Cholesterol, lipid panel, cardiac disease markers for geriatrics (>30 years)
Rectal culture	For *Salmonella*, *Shigella*, *Campylobacter*, *Yersinia*
Mycobacterial testing	Intradermal skin test, lavage-gastric, tracheal, bronchial, and/or Primagam
Imaging	- Radiographs (thoracic, preferably abdominal) recommended for all ages - Abdominal ultrasound for adults (>15 years) - Echocardiography for geriatrics (>30 years)
Viral screening	- Simian Immunodeficiency Virus (SIV) - Simian Foamy Virus (SFV) - Cytomegalovirus (CMV) - Herpes Simplex Virus 1 and 2 (HSV-1, HSV-2) - Influenza A and B (Flu A and Flu B) - Parainfluenza 1, 2, and 3 - Respiratory Syncitial Virus (RSV) - Simian Adenovirus (SA-8) - Measles - Human Varicella Zoster (HVZ) - Epstein Barr Virus (EBV) - (Optional) Hepatitis A and Hepatitis B, Encephalomyocarditis (EMC)
Immunization	See section 6.4

During the quarantine period, specific diagnostic tests should be conducted with each animal if possible or from a representative sample of a larger population (e.g., birds in an aviary or frogs in a terrarium) (see Appendix C). A complete physical, including a dental examination if applicable, should be performed. Animals should be evaluated for ectoparasites and treated accordingly. Blood should be collected, analyzed and then sera banked in either a -70ºC (-94°F) freezer or a frost-free -20ºC (-4°F) freezer for retrospective evaluation. Fecal samples should be collected and analyzed for gastrointestinal parasites and the animals should be treated accordingly. Vaccinations should be updated as appropriate, and if the vaccination history is not known, the animal should be treated as immunologically naive and given the appropriate series of vaccinations.

A tuberculin testing and surveillance program must be established for animal care staff as appropriate to protect both the health of both staff and animals (AZA Accreditation Standard 11.1.3). Depending on the disease and history of the animals, testing protocols for animals may vary from an initial quarantine test to yearly repetitions of diagnostic tests as determined by the veterinarian. Animals should be permanently identified by their natural markings or, if necessary, marked when anesthetized or restrained (e.g., tattoo, ear notch, ear tag, etc.). Release from quarantine should be contingent upon normal results from diagnostic testing and two negative fecal tests that are spaced a minimum of two weeks apart. Medical records for each animal should be accurately maintained and easily available during the quarantine period.

AZA Accreditation Standard

(11.1.3) A tuberculin testing and surveillance program must be established for appropriate staff in order to ensure the health of both the employees and the animal collection.

The AZA Chimpanzee SSP and associated veterinary advisors are working on a comprehensive compendium of referential “normal” values for use during quarantine periods. You may also use MedArks (www.isis.org/CMSHOME/content/MedARKS) to obtain approximate ranges of these values.

List of quarantine procedures to prevent zoonotic disease transmission: Use of personal protective equipment including latex gloves, surgical masks, gowns or surgical scrubs worn only in the quarantine area, and a footbath placed for use upon entering and leaving the quarantine area

Disinfection techniques: Disinfection techniques for equipment and devices are similar to recommendations for all other nonhuman primates.

Necropsy: With any chimpanzee death, a full necropsy (gross and histopathology) is necessary to advance understanding of the species medical management, baseline anatomy, and for appropriate care of the remaining group members. If an animal should die during the quarantine period, a necropsy should be performed to determine the cause of death and the subsequent disposal of the body must be done in accordance with any local or federal laws (AZA Accreditation Standard 2.5.1). Necropsies should include a detailed external and internal gross morphological examination and representative tissue samples form the body organs should be submitted for histopathological examination. A standardized necropsy protocol for great apes (provided by the American Association of Zoo Veterinarians) is detailed in Appendix G.

AZA Accreditation Standard

(2.5.1) Deceased animals should be necropsied to determine the cause of death. Disposal after necropsy must be done in accordance with local/federal laws.

Pathology reports should be submitted to the AZA Chimpanzee SSP veterinary advisor for evaluation and comparison with other deaths and pathology. Cardiac disease – of many causes, with leading of myocardial fibrosis (scarring) – have increased in importance as cause of mortality in the last 5-10 years. Investigation into diagnostic approaches and case management for this species will be ongoing.

6.5 Preventive Medicine

AZA-accredited zoos and aquariums should have an extensive veterinary program that must emphasize disease prevention (AZA Accreditation Standard 2.4.1). The American Association of Zoo Veterinarians (AAZV) has developed an outline of an effective preventative veterinary medicine program that should be implemented to ensure proactive veterinary care for all animals: (www.aazv.org/associations/6442/files/zoo_aquarium_vet_med_guidelines.pdf).

AZA Accreditation Standard

(2.4.1) The veterinary care program must emphasize disease prevention.

An appropriate chimpanzee health care program includes proper animal husbandry and veterinary care based on these current professional standards, and addresses the complete physical and behavioral well-being of the animals. Since chimpanzees have a close taxonomic relationship to humans, they are susceptible to many human diseases. Close contact between the public and chimpanzees in the zoo and aquarium setting may lead to inadvertent exposure to disease for either group. Sub-clinical infectious disease and carrier animals can occur in chimpanzee colonies that can be transmitted not only to naïve conspecifics, but also human caregivers. A successful preventive medicine program therefore addresses the health of both the chimpanzee and the animal care staff.

Veterinary care with a strong preventive medicine program will minimize responsive medicine needs. Caregivers should monitor the individual health of each chimpanzee to facilitate a healthy environment. The basic components of a sound program include: quarantine (see section 6.3), review of individual and group medical histories, daily keeper observations and reports to veterinarians, routine physical examinations, immunization, parasite control, proper nutrition, and monitoring for new medical problems.

Daily observation: Daily observations of chimpanzee health and behavior are critical to maintaining good chimpanzee health on a daily basis. Careful inspections of each individual, how it relates to its conspecifics, appetite, eliminations, and detecting signs of injury or disease should be made by keepers – preferably multiple times or by multiple keepers – each day. At these times, medications and supplements can be provided as prescribed by the attending veterinarians. To complete this process, a written record should document these observations, and should be provided to the veterinarians within 12 hours of completion. Operant conditioning programs should be planned to include behaviors associated with daily management routines and veterinary procedures, such as, weighing, oral inspection, injection presentation, and auscultation (see Chapter 8, section 8.1 for additional information on operant conditioning approaches).

Routine physical examination: Physical examination of all animals in a group is recommended at 18-24 month intervals, preferably in a dedicated veterinary hospital within the zoo and aquarium, or in a designated space within the holding facility. This procedure will require full sedation or anesthesia of the animals for their safety and that of their caretakers (see section 6.5). Once the animal is induced and stabilized, full examinations should include both visual assessment and palpation systematically (see Table 4 – section 6.3). Examinations should also include thoracic auscultation, deep trans-abdominal palpation, rectal palpation, and use of an appropriate instrument to examine eyes, ear canals, nasal passages, and the vaginal vault for female chimpanzees.

Dental care: Dental examination can be facilitated by consultation with a dentist or veterinary dentist. Human dental charts can assist with monitoring long-term problems or routine dental health. Dental cleaning can be opportunistically coordinated with the routine physical examination, and supplemented by operant conditioning that includes tooth brushing. Gingival tissues should be closely monitored for development of periodontal disease; low-dose, daily doxycycline has provided effective assistance in resolution of this condition in humans, and is documented in great apes. Broken teeth or teeth with exposed root canals should be evaluated for extraction or endodontic treatment (root canal) by a dental specialist. Management of a group should not include removal or alteration of teeth to facilitate introductions or to minimize wounding.

Blood collection: Blood collection is accomplished typically from the femoral, saphenous, or cephalic veins, and is used for complete blood count (CBC), serum chemistry panel, viral serology (see Table 4 – section 6.3), blood typing and serum banking for all ages, thyroid assessment, cholesterol, triglycerides, and lipoprotein concentrations, and cardiac markers for adults, especially those over 30 years of age. Representative serum values from a study of *ex situ* chimpanzees can be found in Howell et al. 2003.

Fecal samples: Fecal samples or rectal cultures should be collected routinely for cultures of *Shigella*, *Salmonella*, *Campylobacter*, and *Yersinia*, and if collection history is present, *Clostridium* toxins. This culture panel should be assessed in animals with refractile diarrhea or diarrhea with other clinical signs of systemic illness.

Medical imaging: Radiographs of the thorax and abdomen should be imaged in two views (lateral and dorsoventral/anteroposterior) with the limbs extended from the view. Any skeletal areas of concern or prior injury should be imaged. Abdominal ultrasound should be routinely performed, with rectal ultrasound or other advanced imaging scheduled when needed diagnostically. Due to increasing identification of cardiac disease in this species, complete cardiac assessment is important, and should include an EKG, blood pressure measurement, and echocardiography. This cardiac ultrasound is most successful, especially in older, obese animals, using trans-esophageal echocardiography (TEE). Recording of these dynamic imaging procedures will be helpful for long-term monitoring. A frequent clinical sign of cardiac disease in male chimpanzees is dependent scrotal edema, and so particular attention to this feature is important during the physical assessment.

Mycobacterial testing: Mycobacterial (tuberculosis) testing should be thorough, particularly in groups of unknown history or with known mycobacterial history. It should include minimally an intradermal testing with mOT (mammalian old tuberculin) with a saline or APPD (avian purified protein derivative) in a contralateral location. The usual location for test administration is the palpebrae for ease in reading the test at 24-hour intervals for three days; however, naturally unhaired, thin skin (such as the areolae), or shaved and minimally thickened skin can be utilized with animals trained to present these body parts. Additionally, during the annual examination, a lavage should be collected for mycobacterial culture at an experienced laboratory; this sample can be a gastric, tracheal, or, most ideally, bronchoalveolar in origin. Thoracic radiographs should be closely inspected for characteristic lesions of lymph node enlargement, as this bacterial infection is routinely found as a respiratory disease from inhalation of *Mycobacteria tuberculosis*, or lymphoid infection in atypical mycobacterosis. Whole, heparinized blood can be submitted for interferon testing (Primagam) for evaluation of serologic evidence of mycobacterial infection.

Vaccination: Vaccinations should be considered for each animal and group based on collection history, risk of exposure, and current human prophylaxis guidelines. Pediatricians and infectious disease specialists can serve as both a reference and possibly a source of these products. Separate protocols for juveniles and adults should be developed and maintained. Vaccinations that should be considered minimally include measles, polio, and tetanus. Hand-raised infants may require additional vaccinations as compared to mother-reared infants, due to increased direct exposure to human caregivers. Chimpanzees with routine exposure to free-ranging mammalian wildlife should receive extra-label rabies prophylaxis.

Whenever possible, killed vaccination products should be utilized for vaccinating chimpanzees, rather than modified-live (MLV) products. This choice will minimize adverse vaccination events, particularly those due to reactivation of disease agents. It is particularly important to note that neither efficacy nor safety has been confirmed formally for these vaccination products in chimpanzees, or any great ape species, and so they are used in an extra-label manner. However, with the extensive administrations that have occurred in AZA institutions to date, no particular species sensitivities have been identified. It is still recommended to heed warnings that accompany human guidelines, such as not administering rubella vaccinations to pregnant or non-contracepted, reproductively active females.

Even in proven vaccination protocols, routine adverse vaccination events can occur either immediately as anaphylactic shock, or as delayed hypersensitivity. Anaphylaxis occurs within minutes of the vaccination, with extreme life-threatening signs of collapse, cardiovascular arrest, inability to breathe, and death; it is typically reversible with epinephrine administered parenterally. Delayed reactions occur within hours of the vaccination, and include hives or rash, facial swelling, or itching. These reactions can be controlled with antihistamines. In the 24-48 hours following a vaccination, particularly in juveniles, other clinical signs can be seen that are not adverse reactions, but related to the immune stimulation, including lameness associated with the limb injected, general malaise, anorexia, and lethargy. These signs typically resolve without treatment, but may respond favorably to routine non-steroidal anti-inflammatory drugs (NSAID) administration.

Parasite control: Routine monitoring for endoparasites by fecal flotation should be performed at least twice yearly to monitor seasonal variation. At each evaluation, two samples, separated by several days should be collected to monitor for intermittent shedding. Evaluations should include sedimentation and direct fecal smears for more complete assessment. During quarantine periods, fecal samples should be evaluated by at least three samples taken at weekly intervals. Based on these results, and the baseline history of the group and collection, specific antiparasitic treatment can be prescribed. References for human infections are the preferred information source for treatment regimens. It is important to use effective doses, ensure complete compliance by selection of appropriate vehicles, and repeat the dose at appropriate

intervals. Post-treatment monitoring is necessary to determine long-term treatment needs. Over-treatment or ineffective treatment regimens can contribute to persistent diarrhea through disrupted gastrointestinal bacterial flora. Complete elimination of endoparasites is often not the expected goal, but rather control of clinical signs and reduction of endoparasitic numbers.

Particular helminths of importance to the common chimpanzee include *Enterobius sp.* (pinworms) and *Strongyloides sp*. that may require repeated (even monthly) anthelminthic control for 12-18 months. Diagnosis of *Enterobius* may be suggested by intense anal itching, but may not be apparent on routine fecal flotation. During anesthesia for evaluation, clear adhesive tape can be applied to the anus and perineum to retrieve eggs and make a confirmatory diagnosis. Rotating anthelminthic products can be considered for recalcitrant infections.

Protozoal populations of note include *Balantidium coli* and *Troglodytella* species. Although these protozoal infections rarely produce clinical disease in chimpanzees, they may need management if these animals are in close contact with other great ape species. Routine disinfection of impervious surfaces and replacement of naturalistic substrates is important for control of endoparasites. As chimpanzees can be prone to coprophagy, daily removal of fecal material is strongly recommended, and increased provision of environmental enrichment can assist with reduced completion of parasite life cycles.

Medical management of neonates: Ideally, all healthy infants should be left with their mothers for nursing and social rearing. The most common illnesses associated with chimpanzee neonates are hypothermia, dehydration, electrolyte imbalance, entercolitis, respiratory disease, and urological disturbances. Some neonates may have a primary illness due to prematurity, infectious disease, or congenital defect, and may also be neglected. Neonates requiring nursery care or treatment should be housed in an incubator until the infant can maintain its own body temperature (Lee and Guhad 2001). Specifics of incubator variables should follow closely to those appropriate for human infants, and all efforts should be made to have an incubator positioned nearby for easy access. Veterinarians should be prepared to intervene in the case of weak neonates, by sedation of the dam. In the event of a neonatal fatality, all attempts should be made to retrieve the body promptly to permit full necropsy, to identify congenital problems or maternal-neonatal incompatibility, which may assist with future reproduction efforts.

Medical management of geriatrics: With advanced age in chimpanzees, veterinarians and nutritionists should tailor diets to provide for changing nutritional needs and to maintain good body condition. Common age-related health issues in geriatric chimpanzees include renal disease or cardiac failure, and these may require further specific adaptations of the diet through supplements or restrictions. Physicians or medical nutritionists are particularly helpful in assessing more complex individual needs. Well-monitored exercise programs are important to maintain good health in the geriatric animal. Daily exhibit use may require furniture adaptation to accommodate arthritic or less agile animals. Altered mental state or agility in geriatric animals may require adaptation to enrichment activities as well.

With the expectation of increasing medical concerns in geriatric animals, and the necessity to initiate prompt treatment to minimize long-term deleterious effects, it is important that routine physical examinations continue, or even increase in frequency, for these individuals. Veterinarians should be aware of the increased anesthetic risks with geriatric animals, but not permit them categorically to dissuade sound health care programs.

Zoonotic disease control: As stated in the Chapter 6.4, AZA institutions must have zoonotic disease prevention procedures and training protocols established to minimize the risk of transferable diseases (AZA Accreditation Standard 11.1.2) with all animals. Keepers should be designated to care for only healthy resident animals, however if they need to care for both quarantined and resident animals of the same class, they should care for the resident animals with a change of clothing between these facilities, and preferably with a shower between the two facilities. A shower is required if staff have to return to the collection animals. Equipment used to feed, care for, and enrich the healthy resident animals should only be used with those animals.

AZA Accreditation Standard

(11.1.2) Training and procedures must be in place regarding zoonotic diseases.

Zoonotic disease is important for both chimpanzees and their caretakers. It is important to monitor chimpanzee health regularly through a preventive medicine schedule for the safety of the conspecifics and involved humans. Similarly, caretakers and other in-contact staff should participate in institutional health programs, including an annual re-evaluation of mycobacteriosis status through skin testing or interview, where skin reaction occurs or prior vaccination is known. This should include personnel that work indirectly with non-human primates in handling their biomaterials or veterinary care. Recommended guidelines on non-human primate handling, developed by the AZA Animal Health Committee and the American Association of Zoo Veterinarians (AAZV) should be reviewed for institutional application; vaccination prophylaxis for staff in accordance with Centers for Disease Control (CDC) guidelines should be considered at each institution.

Humans that are ill should not work directly with non-human primates, or prepare their diets. When this is not possible, full personal protective equipment (facemask and barrier gloves) should be worn. For daily food management, Hazard Analysis Critical Control Points (HACCP) methods should be instituted in the central nutrition area and individual non-human primate kitchens. This includes handling, washing, storage, preparation, and provision of foodstuffs to the animals.

Respiratory diseases are some of the more common causes of illness in non-human primates. Staff should be encouraged to work with an occupational health provider to monitor their own health, remain vaccinated, and fully understand the risks of working with non-human primates. Staff veterinarians can provide an information source to these physicians, particularly in times of increased human risk, such as illness or during pregnancy. Veterinary care of chimpanzees is similar to good medical care and preventive health of a human. Routine evaluation of staff should be included in the health assessment of these primates. Reports generated annually by the veterinary advisors highlight changes in protocols of preventive medicine and disease concerns for this species, and should be consulted in addition to this document.

Animals that are taken off zoo/aquarium grounds for any purpose have the potential to be exposed to infectious agents that could spread to the rest of the institution's healthy population. AZA-accredited zoos and aquariums must have adequate protocols in place to avoid this (AZA Accreditation Standard 1.5.5).

AZA Accreditation Standard

(1.5.5) For animals used in offsite programs and for educational purposes, the institution must have adequate protocols in place to protect the rest of the collection from exposure to infectious agents.

Also stated in Chapter 6.4, a tuberculin testing and surveillance program must be established for animal care staff, as appropriate, to protect the health of both staff and animals (AZA Accreditation Standard 11.1.3). Depending on the disease and history of the animals, testing protocols for animals may vary from an initial quarantine test, to annual repetitions of diagnostic tests as determined by the veterinarian. To prevent specific disease transmission, vaccinations should be updated as appropriate for the species.

AZA Accreditation Standard

(11.1.3) A tuberculin testing and surveillance program must be established for appropriate staff in order to ensure the health of both the employees and the animal collection.

Facilities housing chimpanzees should adhere to all federal, state and other regulatory agencies that define cleaning and decontamination procedures for your institution. Care should be taken to monitor the potential toxicity level of all cleaning materials and allow appropriate ventilation and/or drying times as necessary.

6.6 Capture, Restraint, and Immobilization

The need for capturing, restraining and/or immobilizing an animal for normal or emergency husbandry procedures may be required. All capture equipment must be in good working order and available to authorized and trained animal care staff at all times (AZA Accreditation Standard 2.3.1).

AZA Accreditation Standard

(2.3.1) Capture equipment must be in good working order and available to authorized, trained personnel at all times.

Restraint: Physical (or manual) restraint can be very stressful to chimpanzees and dangerous for the humans trying to hold the animal. Manual restraint is not recommended. The AZA Chimpanzee SSP recommends a formal positive-reinforcement training program to facilitate, among other things, crating of the animals, and the ability to hand-inject chimpanzees (Schapiro et al. 2005). Recent research has shown these procedures are less stressful than those in which the subject does not have the opportunity for choice and control, such as darting (Lambeth et al. 2006). When voluntary injection cannot be accomplished, other means may be necessary.

Chemical immobilization: Induction of anesthesia in chimpanzees is routinely accomplished by intramuscular injection of a sedative(s) following an appropriate (12-24 hour) fasting interval. In a 2006 survey of attending veterinarians in AZA-accredited institutions holding chimpanzees (n=40), 88% responded to queries about induction regimens, supplementation, adjustment of protocols for known cardiac patients, intubation frequency, reversibility of anesthetic protocols, and changes in protocols over the last decade. Information from this survey is summarized below.

Typical immobilization agents for chimpanzees included telazol (tiletamine-zolazepam), ketamine, or combination of these products with medetomidine. Occasionally, xylazine, benzodiazepenes (diazepam or midazolam), or butorphanol were utilized in the combinations or as premedications. The following table (Table 5) provides a list of suggested anesthesia protocols for chimpanzees.

Table 5: Anesthesia protocols used at AZA-accredited institutions holding chimpanzees

Drug combination	Dose (mg/kg)	Frequency utilized*
Telazol (T) alone	T: 1.5-3	15%
	T: 3-6	34%
Ketamine (K) alone	K: 2-5	9%
	K: 8-10	9%
Telazol (T) and Ketamine (K)	T: 1-3; K: 1-3	3%
Telazol (T) and Medetomidine (Me)	T: 2; Me: 0.02-0.03	9%
Ketamine (K) and medetomidine (Me)	K: 2; Me: 0.015-0.025	9%
	K: 2-5; Me: 0.03-0.04	18%
	K: 5-7; Me: 0.025-0.07	25%
Ketamine (K) and Midazolam (Mi)	K: 4-5; Mi: 0.05-0.1	3%
Medetomidine (Me), Butorphanol (B), and Midazolam (Mi)	Me: 0.015; B: 0.085: Mi: 0.06	3%
Medtomidine (Me), Butorphanol (B), and Ketamine (K)	Me: 0.015; B: 0.15-0.3; K: 1.5	3%

*Of the 35 responding veterinarians, this is the percentage of veterinarians using this regimen. In some cases, veterinarians provided 2 or more routine induction protocols.

Following administration of the sedative, staff should wait until they are confident that the subject is unconscious. Such assurance may be gained by looking for reactions to loud calls, or perhaps a light poke with a long object such as a broomstick. If there is no reaction to these stimuli, two staff should enter the animal area together, leaving at least one alternate escape route available, and a third staff member should be watching the procedure from outside the animal area with access to emergency materials (radio, door operators). The staff members in direct proximity to the anesthetized chimpanzee should administer secondary restraint by applying a net or cargo net over the subject. This net should be sturdy enough to facilitate carrying the animal to the gurney or other mobile wheeled device. Further attempts to gauge the chimpanzee's level of consciousness should be made before any substantive physical contact (i.e. picking up) is made. Once there is complete assurance that the subject is unconscious, only then should the subject be picked up by multiple staff members. Assurance should be made that the head does not loll back or strike walls or floors during transport. The chimpanzee should remain in the netting until fully intubated and under maintained chemical immobilization.

Supplementation protocols: The long-term maintenance of the anesthetic event will be determined by the nature of the veterinary procedure, and can be accomplished by supplemental parenteral agents or inhalant methods. It is strongly encouraged that in procedures longer than 30 minutes (i.e., most standard physical examinations), chimpanzees be intubated and maintained by inhalant agents such as isoflurane or sevoflurane in oxygen. Other typical supplementation agents and doses identified by the survey are listed in the following table (Table 6):

Table 6: Supplemental agents for anesthesia

Drug	Dose (mg/kg)	Frequency utilized**
Telazol	1-2	9%
Ketamine	1-2	50%
	3-4	13%
Propofol	1-2	3%
Diazepam or midazolam	0.1	3%

** Of the 35 responding veterinarians, this is the percentage of veterinarians using this regimen.

Cardiac issues: Revision of the induction protocol should be considered for animals with cardiac disease or risk factors for cardiac disease, such as obesity, advanced age (>30 years), or undocumented cardiac health in older adults. Possible revisions that should be considered include: using the lowest dose of anesthetic agent; the use of ketamine alone as a primary induction agent; avoiding the use of alpha-2 agonists (e.g., xylazine or medetomidine); or discontinuing elective sedations in known cardiac disease patients.

Reversal: Medetomidine induction can be reversed intra-procedurally, or at the conclusion of the procedure, with 5mg of atipamezole for each 1mg of medetomidine utilized. All but one institution using medetomidine reversed the sedation in this manner. Institutions using xylazine utilized yohimbine (0.13mg/kg) to reverse the sedation. Where butorphanol or midazolam are utilized, narcan or flumazenil respectively can be used for reversal.

Anesthetic monitoring: Intra-procedural monitoring of heart rate and rhythm, pulse quality, capillary refill time (CRT), breathing (respiration depth and rate), and body temperature, is the minimal assessment necessary during an anesthetic event for chimpanzees. Close monitoring should be ongoing throughout the procedure. For protracted procedures, it is recommended that EKG, pulse oximetry, and blood gases be added as monitoring tools. Although re-positioning will occur due to the procedure needs, lateral recumbency typically provides improved anesthetic maintenance.

During recovery, chimpanzees should be positioned in lateral recumbency to minimize risk of aspiration if regurgitation, vomiting, or heavy salivation occurs. It may be helpful to maintain this position with hay or blankets placed along the animal's dorsum, with the head slightly elevated but the mouth directed downwards.

6.7 Management of Diseases, Disorders, Injuries and/or Isolation

AZA-accredited zoos and aquariums should have an extensive veterinary program that manages animal diseases, disorders, or injuries and has the ability to isolate these animals in a hospital setting for treatment if necessary. Staff should be trained for meeting the animal's dietary, husbandry, and enrichment needs, as well as in restraint techniques, and recognizing behavioral indicators animals may display when their health becomes compromised (AZA Accreditation Standard 2.4.2). Protocols should be established for reporting these observations to the veterinary department. Hospital facilities should have x-ray equipment or access to x-ray services (AZA Accreditation Standard 2.3.2), contain appropriate equipment and supplies on hand for treatment of diseases, disorders or injuries, and have staff available that are trained to address health issues, manage short and long term medical treatments and control for zoonotic disease transmission.

AZA Accreditation Standard

(2.4.2) Keepers should be trained to recognize abnormal behavior and clinical symptoms of illness and have knowledge of the diets, husbandry (including enrichment items and strategies), and restraint procedures required for the animals under their care. However, keepers should not evaluate illnesses nor prescribe treatment.

AZA Accreditation Standard

(2.3.2) Hospital facilities should have x-ray equipment or have access to x-ray services.

Traumatic injuries: Traumatic wounds are not uncommon in socially housed chimpanzees. These injuries can result from normal hierarchy disputes as juveniles mature, during introductions of new group members, or in groups with stable membership. Behavioral assessments of groups and individuals are important to minimize long-lasting injuries or delays in introductions. Operant conditioning may facilitate resolution of this social altercation, but other emergency procedures should be prepared in the event of serious altercations

When serious traumatic wounds result, anesthesia is often required for direct management (see section 6.5), including thorough cleaning, debridement, and lavage. Primary closure of the wound should be considered by depth and effect on a particular area, with caution not to entrap infectious debris or create an anaerobic environment. Post-operative lavage or topical treatment of open wounds may be possible with operant conditioning, and can use diluted antiseptics (such as chlorhexidine or povidone-iodine) or topical agents.

Therapeutic agents: Human reference texts and formularies are excellent sources for dose recommendations for chimpanzees, given the consistent size of adult chimpanzees both with humans and each other (i.e., typically 50-90 kg/110-198 lb total body weight). This permits the approach of dosage "by animal" rather than by body weight. The exception is pediatric patients, where a dose rate (mg/kg) is more appropriately applied.

Veterinarians may legally obtain any human or animal drug that is approved by the FDA. However, none of these products are approved for use in chimpanzees, nor have they been evaluated formally for safety or efficacy, so all applications are an extra-label use.

- Antimicrobials: Antibiotic and antifungal therapy should be evaluated individually, and be based on bacterial culture and sensitivity whenever possible. It is important to utilize these products judiciously and appropriately to minimize antimicrobial resistance. For example, these agents should be administered only for control of confirmed secondary bacterial infections when a respiratory viral infection is present.
- Anthelminthics: As with antimicrobials, antiparasitic products should be targeted to the specific parasite. Helminths have been treated by benzimidazoles (e.g., fenbendazole or mebendaozole), avermectins (ivermectin), and pyrantel pamoate. Protozoal infections have been addressed by metronidazole and doxycycline.
- Analgesics: Pain control is an increasingly common component of complete veterinary care for all non-human primate species. It should be considered for chronic or acute needs. Chronic needs would include arthritis management. Balanced analgesia requires pharmaceutic doses be maintained at minimum effective doses to reduce adverse effects. This balance can be achieved through anti-inflammatories (non-steroidal, steroidal), nutraceuticals, and environmental adaptations (e.g., comfort, heat source, furniture changes). Acute or short-term needs, such as operative sources, will impact timing and duration of pharmaceutic administration. Balanced use of non-steroidal anti-inflammatories (e.g., aspirin, ibuprofen, and acetaminophen) with narcotics (e.g., butorphanol, buprenorphine, codeine, tramadol, and fentanyl) will assist with optimum pain control.

Hereditary diseases: Chimpanzees can and do present almost all of the same hereditary diseases and disorders as do humans. In most cases, human specialists should be contacted for specific treatment regimens.

Behavioral indicators of compromised health: Chimpanzees who are experiencing health problems may display any of the following: increased lethargy, reduced social activity and lack of appetite. In general, any sign that if displayed in a human indicates ill health should also apply to chimpanzee. It is important to note that like all wild animals, chimpanzees will mask outward signs of pain and illness so if there are observable physical indicators of illness, it is likely that the individual chimp is experiencing high levels of discomfort.

Protocols to follow if staff notes these behavioral indicators: Report to supervisors and/or facility veterinarian as per individual facility protocol. Animal care staff should be specific about their observed potential indicators of compromised health and make it clear if they are concerned that the situation is an emergency.

Diseases, disorders or injuries which are typical: Heart disease and renal failure are common causes of mortality in chimpanzees. Respiratory illness, parasitic infections, and traumatic injuries (typically inflicted by another group member) are also commonly seen. See Sections 6.4 and 6.6 for more information.

Hospitalization and isolation: Under normal conditions, it is essential to provide the space required to house chimpanzees in social environments. However, under certain conditions (e.g., disease outbreaks, quarantine), it may be necessary to isolate an individual from a group for finite periods of time. Given the importance of social relations for this species, it is not surprising that individual caging has measurable (and usually negative) effects on chimpanzees. Chimpanzees react negatively to "isolation" housing in which there is no visual or auditory contact with conspecifics (see Capitanio 1986).

In general, chimpanzees raised without appropriate socialization develop a broad range of stereotypies and self-directed behaviors, such as rocking, swaying and eye-poking (Davenport and Menzel 1963; Walsh et al. 1982), and react poorly to novel objects and environments, indicating their inability to cope with such circumstances (Menzel 1964). The effects of isolation rearing extend to adulthood as well, including inadequate maternal behavior (Davenport 1979) and enduring abnormal behaviors.

Individual housing later in life has also been related to higher levels of abnormal behaviors. Brent et al. (1989) noted significant changes in behavior in chimpanzees that were moved to individual caging for a research protocol, including decreased levels of environmental manipulation and vocalizations, and increased stereotypical behavior such as rocking, pacing, and spinning. Baker (1996) reported that although individually-housed chimpanzees demonstrated roughly the same levels of abnormal behavior as pair-housed chimpanzees, the degree of severity of these behaviors differed. Individually-housed chimpanzees showed behaviors such as self-aggression that were rarely evident in socially-housed animals. Given the relationship between abnormal behavior patterns and individual caging, and the detrimental effects of individual housing on the social, maternal, and reproductive behavior of chimpanzees, every effort should be made to limit or eliminate individual housing.

When individual housing has to be used (e.g., during treatment of an infectious agent), an expanded enrichment program should be implemented to alleviate the boredom and stress associated with socially, and often physically restricted environments. Some of the most practical and useful enrichments increase social opportunities (e.g., placing individually-housed chimpanzees within visual, olfactory or auditory range of other chimpanzees), use time consuming feeding devices (see Chapter 5, section 5.2), offer a variety of novel objects (and especially destructible items), increase goal oriented behavior with tool using tasks or computer video tasks, and increase environmental stimulation with a variety of sensory enrichments (Brent 2001). Social attention from human keepers and trainers might also have a positive effect.

The use of television has been suggested as a possible enrichment initiative for chimpanzees (Rumbaugh et al. 1989). Bloomsmith et al. (1990) found that the use of videotapes appears to be more effective for singly housed animals. While not all chimpanzees attend to TV, for those who demonstrate an interest, it can serve as a form of enrichment.

More information: Additional information on the management of individually-housed chimpanzees can be found in Brent (2001).

AZA Accreditation Standard

(1.5.8) The institution must develop a clear process for identifying and addressing animal welfare concerns within the institution.

AZA-accredited zoos and aquariums must have a clear process for identifying and addressing animal welfare concerns within the institution (AZA Accreditation Standard 1.5.8) and should have an established Institutional Animal Welfare Committee. This process should identify the protocols needed for animal care staff members to communicate animal welfare questions or concerns to their supervisors, their Institutional Animal Welfare Committee or if necessary, the AZA Animal Welfare Committee. Protocols should be in place to document the training of staff about animal welfare issues, identification of any animal welfare issues, coordination and implementation of appropriate responses to these issues, evaluation (and adjustment of these responses if necessary) of the outcome of these responses, and the dissemination of the knowledge gained from these issues.

Given the wide variety of zoos and aquariums that house chimpanzees, the AZA Ape TAG and Chimpanzee SSP cannot provide specific recommendations for the best approaches to take to communicate animal welfare issues effectively within every institution. All animal caretakers that work with chimpanzees should be aware of institutional

protocols in place for them to identify, communicate, and hopefully address potential animal welfare issues that are associated with the care and management of these animals.

Euthanasia and necropsy: As care givers for the animals residing in our zoos and aquariums, it is vital that we provide the best care possible for them until the time their health deteriorates to a point where euthanasia is the most humane treatment, or the animal dies on its own. Euthanasia should be considered for progressively deteriorating quality of life, intractable disease without cure, or irreparable trauma. Options for humane euthanasia include barbiturate or sedative overdose as dictated by the American Veterinary Medical Association (AVMA) Guidelines for Euthanasia. Necropsies should be conducted on deceased animals to determine their cause of death and the subsequent disposal of the body must be done in accordance with any local, state, or federal laws (AZA Accreditation Standard 2.5.1). Necropsies should include a detailed external and internal gross morphological examination and representative tissue samples from the body organs should be submitted for histopathological examination. A standardized necropsy protocol for great apes (provided by the American Association of Zoo Veterinarians) is detailed in Appendix G. Pathology reports should be submitted to the AZA Chimpanzee SSP veterinary advisor for evaluation and comparison with other deaths and pathology.

AZA accreditation standard

(2.5.1) Deceased animals should be necropsied to determine the cause of death. Disposal after necropsy must be done in accordance with local/federal laws.

Chapter 7. Reproduction

7.1 Reproductive Physiology and Behavior

It is important to have a comprehensive understanding of the reproductive physiology and behaviors of the chimpanzees in our care. This knowledge facilitates all aspects of reproduction, artificial insemination, birthing, rearing, and even contraception efforts that AZA-accredited zoos and aquariums strive to achieve.

Females: In the wild, females exhibit their first estrous swelling when they are 8.5-9.5 years old (Tutin 1980). However, in zoos and aquariums this may occur several years earlier. In their demographic comparison of wild chimpanzees in Gombe and AZA Chimpanzee SSP managed populations in zoos, Earnhardt et al. (2003) found that AZA Chimpanzee SSP females commonly reproduce at a much younger age than females in the Gombe population. Although menarche typically does not occur for 1-1.5 years after the first swelling, chimpanzee females in zoos and aquariums have given birth as early as 5.6 years of age (Earnhardt et al. 2003). The sharpest contrast is between the 5-10 year old age group, with 54.7% of first births occurring in this cohort in zoos and aquariums, but 0% in the wild.

The conspicuous genital swelling of the female chimpanzee increases in size and turgidity in response to hormonal changes corresponding with impending ovulation. The genital swelling is the critical link between the endogenous hormonal environment and the expression of sociosexual behavior (Bettinger and DeMatteo 2001). The normal (menstrual) cycle is 36 days, with a 72-hour menses. Grossly visible blood in the urine is inconsistently observed, although hematuria can be detected by reagent strips, and may be used to track cycles for individual females. Sexually mature female chimpanzees also develop marked swelling of the perianal and perineal tissues due to interstitial fluid accumulation that fluctuates with hormonal influences. This genital swelling (intumescence) increases to peak size and turgidity during the follicular phase of the cycle. Lutenizing hormone (LH) increases causing ovulation to occur during the last 24-28 hours of maximal swelling. The luteal phase, following ovulation, is characterized by reduction of swelling as the estrogen concentrations decline and progesterone concentrations rise. Perineal intumescensce is a distinct visual marker of receptivity and potential fertility with marked impact on sociosexual behavior. During peak swelling, females demonstrate more assertive behavior. Young adolescent females are more likely to solicit copulation than are older females.

Males: The youngest male to reproduce in the Gombe population was 12.9 years of age (Earnhardt et al. 2003). In zoos and aquariums, males have been known to successfully father offspring as young as six years of age. Although maturity in the wild does not usually begin until three years after the time of the first sexual development, males in zoos and aquariums attain adult hormone levels at around seven years, and adult weight and dentition around 8-9 years (Kraemer et al. 1982).

Estrous swellings are highly attractive to male chimpanzees. Males tend to spend a significantly increased amount of time in proximity to females that are swollen. Copulation may occur at any time during the female's estrous cycle, including during pregnancy and menstruation. In addition to the degree of the female's swelling, other factors may also influence the likelihood of copulation, such as age, time of day, and level of excitement. Either sex may initiate copulation, but it is most commonly initiated by males in both the wild and in zoos and aquariums. Copulation strategies by the males vary, but may include "consorting" with a female out of sight of the rest of the group. Group males of all ranks interact preferentially with intumescent females and their offspring. Competition between males, concurrent with agonistic behaviors, will occur with increased frequency in the presence of cycling females.

Separation of mother/offspring: In the wild, offspring may typically stay with their mothers for at least six years, sometimes longer. At the age of adolescence, females may transfer from one community to another. In zoos and aquariums, it may be easier to introduce a young female developing her first sexual swellings to a new group before she is at the age where established females may consider her "competition" for the males' attention. It is also important to remember the potential threat from the resident adults if the young female is carrying an infant when she is introduced (there is a risk of infanticide). In addition, an adolescent male may be considered a threat to an adult male as well. This is considered an extremely difficult age to introduce a male. If breeding recommendations call for the emigration of a young chimpanzee from one group to another, it is recommended that young chimpanzees, in particular males, be transferred and introduced in a new group by the age of 5, when they are still considered juveniles, and their presence may not seem so threatening (McNary 1992). In all cases, the relative risks of the social introduction should be weighed against the relative benefits for both the immigrant and resident individuals.

Youngsters should stay in their natal group for at least 4 years, or as long as is necessary. There appears to be no evidence of negative effects of staying too long in the natal group other than the difficulty of integration at a later age (see above), and the necessity to avoid inbreeding. Chimpanzee communities in the wild are frequently multi-generational. In zoos and aquariums, multi-generational groups have been formed over years usually by the introduction of new breeding males to a group, to avoid daughters breeding with fathers, or the use of reliable birth control. It is has been documented

that mother-raised infants show greater adult social and sexual competence when reared in the presence of cycling females in a group.

Reproductive hormone monitoring: Chimpanzees exhibit an approximately 36-day menstrual cycle that can be monitored by two external features: genital swelling and menstrual blood (Yerkes and Elder 1936; Elder 1938; Young and Yerkes 1943; Graham et al. 1972; Nadler et al. 1985). The genital swelling, which encompasses the labia and perianal region, results from an accumulation of interstitial fluid (Yerkes and Elder 1936; Clark and Birch 1948), and fluctuates in size and turgidity in response to changing levels of ovarian hormones (Allen et al. 1936; Fish et al. 1941; Clark and Birch 1948; Graham et al. 1972; McArthur et al. 1981; Nadler et al. 1985). Menstrual bleeding, which lasts about 3 days, may be observed by close visual observation of the labia. The use of a Hemastik® to detect hemoglobin in a urine sample can confirm menstruation; however, due to the sensitivity of this test, false positives may occur (Bettinger and DeMatteo 2001). Approximately 10 days before the mid-cycle estrogen peak, the genitals swell to maximal size and turgidity. The luteinizing hormone (LH) surge and ovulation occurs during the last 1-2 days of the maximal swelling (Elder 1938; Graham et al. 1972; Graham 1981; Nadler et al. 1985). Regression of the genital swelling is usually associated with decreasing levels of estrogen and increasing levels of progesterone (Graham et al. 1972; McArthur et al. 1981; Nadler et al. 1985).

Type of conception typically achieved: Natural conception is the recommended form of conception for chimpanzees. Artificial insemination (AI) techniques have been successfully implemented with this species (Martin et al. 1978) including conception from cryopreserved sperm collected postmortem (Kusunoki et al. 2001).

Problems or issues known to occur with mating and/or conception: Nursery-reared chimpanzees especially males, frequently do not exhibit normal sexual behavior and may overly orient to humans and/or masturbate instead of copulate (Bloomsmith et al. 1991). Some females refuse to copulate by evading the male if possible. Only about 30% of recommending breeding pairs produced viable offspring in the last 10 years, due mostly to behavioral problems or incompatibilities. Future research is required to improve this success rate.

Pregnancy: Diagnosis of pregnancy can be accomplished by testing urine, usually from the first morning voiding, using over-the-counter human pregnancy test kits. Pregnancy can subsequently be confirmed using ultrasonography after four months.

Pregnant females should be maintained with the group throughout the pregnancy under normal circumstances. Managers should monitor the behavior of the group to the pregnant female as the pregnancy advances. In almost all circumstances, the birth of the infant should occur in the home environment and with the social group present. The presence of youngsters and adolescents may increase the risk of aggression to the newborn but the benefit of reducing social stress most often outweighs that risk.

7.2 Artificial Insemination

The practical use of artificial insemination (AI) with animals was developed during the early 1900s to replicate desirable livestock characteristics to more progeny. Over the last decade or so, AZA-accredited zoos and aquariums have begun using AI processes more often with many of the animals residing in their care. AZA Studbooks are designed to help manage animal populations by providing detailed genetic and demographic analyses to promote genetic diversity with breeding pair decisions within and between our institutions. While these decisions are based upon sound biological reasoning, the efforts needed to ensure that transports and introductions are done properly to facilitate breeding between the animals are often quite complex, exhaustive, and expensive, and conception is not guaranteed.

AI has become an increasingly popular technology that is being used to meet the needs identified in the AZA Studbooks without having to re-locate animals. Males are trained to voluntarily produce semen samples and females are being trained for voluntary insemination and pregnancy monitoring procedures such as blood and urine hormone measurements and ultrasound evaluations. Techniques used to preserve and freeze semen has been achieved with a variety, but not all, taxa and should be investigated further.

Chimpanzees have been bred using artificial insemination techniques (Martin et al. 1978) including the use of frozen sperm collected postmortem (Kusonoki et al. 2001). The AZA Chimpanzee SSP is supportive of institutional efforts to facilitate artificial insemination, especially with unrepresented individuals; however, official recommendations will be made solely on natural conception. Semen can be collected using an artificial vagina (Bowsher et al. 1992) and positive reinforcement techniques.

7.3 Pregnancy and Parturition

It is extremely important to understand the physiological and behavioral changes that occur throughout an animal's pregnancy. It is highly recommended that institutions contact the AZA Ape TAG's Birth Management Subcommittee as soon as a chimpanzee pregnancy is confirmed. This group will provide information to plan for all possible outcomes of a pregnancy, including mother-rearing, hand-rearing, surrogate-rearing, and re-socializing. Chimpanzees should be maintained within their family group throughout their pregnancy, during parturition, and during the immediate post-natal

bonding period. In some cases, such as the presence of a particularly troublesome adolescent, it may be necessary to separate the pregnant female temporarily, but it is strongly recommended that the female remain with other conspecifics if at all possible. Chimpanzees that are pregnant or with young should not be subjected to social introductions with unfamiliar conspecifics.

Pregnancy can be monitored with urinary human chorionic gonadotropin tests, and concurrently confirmed with ultrasonography. Gestation has been reported in the range of 227 + 12 days (see Chapter 7, section 7.3 for additional information). It is recommended that reproductively active females receive oral folic acid supplementation at 400 mcg/day for the month prior to conception, in order to minimize neural tube defects. This vitamin is routinely provided in most adult human vitamin supplementations. Routine iron supplementation during pregnancy is not needed to prevent anemia in either the dam or fetus, but may be provided in known cases of iron-deficiency anemia of the dam. Pregnant females should receive iron supplementation during the last trimester of pregnancy when fetal blood formation is greatest (Beard 2000).

Serial serum levels of gonadotropins, prolactin and sex steroids in the non-pregnant and pregnant chimpanzees were studied by Reyes et al. (1975). They reported that serum levels of FSH, LH, chorionic gonadotropin (CG), prolactin, estrone (E1), estradiol-17Beta (E2), estriol (E3) and progesterone were measured at 2-3 day intervals in 4 chimpanzees through 2-3 menstrual cycles, and serially through subsequent pregnancies. The hormone patterns of the menstrual cycles were similar to those in humans, with high levels of FSH in the early follicular phase, followed by rising E2 concentrations to a peak (up to 35 ng/dl) at or just before a midcycle LH/FSH peak. In most cycles there was a secondary E2 rise and progesterone rose to values above 500 ng/dl during the luteal phase. There was no consistent pattern in prolactine levels through 3 menstrual cycles. A simultaneous increase in E2 and LH/CG levels and a fall in FSH about 10 days postovulation indicated fertilization and implantation. Other early signs of pregnancy were persistent luteal range progesterone concentrations and rising levels of E1 and E3. Peak CG levels (56-154 IU/ml) occurred 30-50 days after the midcycle LH/FSH peak, followed by a decline and then a small secondary rise to (to 1 IU/ml) before term. E1, E2 and E3 levels rose more rapidly after 80 days to a peak at term (E1: 180-300 ng/dl; E2: 500-800 ng/dl; and E3:400-1000 ng/dl). Progesterone levels showed one peak coincident with the CG peak, and a secondary rise after about 80 days to maximal values at term of 49-120 ng/ml. Prolactin levels increased during pregnancy with irregular fluctuations (7-127 ng/ml). These findings indicate that the hormonal patterns during pregnancy in the chimpanzee are remarkably similar to those in humans.

There is relatively little published data on the behavior of pregnant female chimpanzees and associated group interactions. More detailed accounts of these circumstances will help define future management considerations to improve the health and welfare of mothers and offspring. Predicting parturition is also a difficult endeavor and rife with mythology and unsubstantiated methodology. There are accounts of females socially separating from the group, becoming irritable, less active and changing eating patterns, but none of these have been empirically evaluated. Given the association of human activity and chimpanzee behavior (Lambeth et al. 1997) it was postulated that zoo chimpanzees might be more likely to give birth on less-crowded weekdays than busy weekends (Alford et al. 1992) – however, a recent analysis of parturition dates for zoo-housed chimpanzees discounted this effect (Wagner and Ross 2008), showing that zoo-housed chimpanzees are no more likely to give birth on any particular day of the week.

7.4 Birthing Facilities

As parturition approaches, animal care staff should ensure that the mother is comfortable in the area where the birth will take place. The mother should be allowed to give birth in her home enclosure and with the rest of the social group present. As such, there is not a separate birthing facility per se. Ensure that this area is “baby-proofed” by ensuring that there are no small openings in which the baby may get stuck. Any pools or water-elements should be drained for at least the first 6 months and kept shallow for the first couple years to prevent accidental drowning. An over-abundance of bedding material should be provided around the time of parturition and maintained at a high level throughout the first year as mother-infant nesting is particularly important. The temperature of the facility should be carefully monitored and colder microclimates (i.e. drafty areas) should be eliminated when possible.

7.5 Assisted Rearing

In the wild, female chimpanzees maintain close relationships with their offspring for a relatively long period of infancy and juvenile development. Most mothers have their infants in constant, or nearly constant, contact until the infants first break contact with the mother between 6-12 months. Around 4-5 years of age, youngsters begin to sleep separately from their mothers, and will forage independently (Clark 1977). However, the maternal bond remains strong for many more years, and young chimpanzees will maintain a close association with their mothers until the age of 8-11 years when they achieve some degree of adult-like independence. Although social maturity tends to happen earlier for chimpanzees in zoos and aquariums, these facts underscore the importance of the mother-infant relationship.

The AZA Chimpanzee SSP recommends that in virtually all circumstances, mothers have the opportunity to rear their infants themselves and without human intervention. The rare circumstances of human intervention include maternal abuse, neglect, or significant illness or injury to the mother or infant. In these conditions, where the life of the mother or

infant is in danger, managers should intervene. In some circumstances, the infant may be able to be reintroduced to the mother soon after the initial separation, and mother-rearing may be continued. However, in cases of life-threatening abuse or neglect, alternative rearing strategies should be considered. It is recommended that the first alternative to mother-rearing is to re-socialize the infant with other chimpanzees as soon as it is safely possible. Ideally this would be with a surrogate mother in the natal group, but it is also possible that an unfamiliar surrogate could suffice.

In many cases, the adequacy of the mother's care is not clear. Institutions should stay in close contact with the AZA Chimpanzee SSP to receive advice on whether particular behaviors are deemed enough to pull the baby into a temporary human-rearing situation. New mothers may not want to carry the baby all the time, and will occasionally put the newborn on the ground by itself. While this behavior is not preferable is does not necessarily brand the mother as neglectful. Note how the mother reacts when the baby cries or is in apparent danger (perhaps due to proximity to another chimpanzee). If the mother returns to collect the infant in these circumstances, there is reason for optimism. If the infant appears not to be getting fed on a regular basis (once every 1-3 hours), there may be reason to supplement his diet by bottle-feeding through the mesh if possible. In one recent case, a mother ignored her newborn and as a result the infant was not getting fed enough. The mother was anesthetized and the infant placed on the nipple. When the mother awoke, the bond was established and there was no need for human rearing intervention (S. Tanner, personal communication).

The age at which to introduce an infant to a potential surrogate will vary with the infant's health and personality, as well as the surrogate's health, personality, and maternal skill. This introduction can occur as early as 6 months of age. Before this time, the infant will likely have to be reared by human caregivers. Managers should be in touch with the AZA Ape TAG's Birth Management Subcommittee to discuss potential surrogates, contemporary hand-rearing strategies, and other re-socializing information.

A hand-rearing protocol should meet both the physical needs of the infant as well as the psychological and social needs of the infant (Porton 1992). In general, the recommendations for hand-rearing an infant chimpanzee requires:

- 24-7 care
- Rearing in the presence of conspecifics for early reintroduction
- Species-specific handling of infant (mimicking a mother chimp)
- Institutional commitment to follow through with the rearing process until full re-integration is complete

Nursery environment: An off-exhibit nursery should be used, as having a nursery on public view may affect public perception of ape infants and encourage primates as pets. The nursery area should be made "primate-proof" (i.e., no accessible containers, foods, or hazardous or breakable materials). It is essential to have a small kitchen and bathroom in proximity to the nursery, and these areas should contain a refrigerator, microwave, sink, and storage (washer and dryer are optional). The entrance area to the nursery should be equipped with a footbath. This is a staging area where animal caretakers leave shoes and street clothes, and change into scrubs. Sanitary protocols should be used at all times. Keepers should wash their hands before entering the nursery, after changing diapers, before preparing food, and at all other appropriate times. Hospital scrubs or gown, surgical mask and foot covers should be worn when an infant is pulled. When an infant's health is stabilized, the mask is optional. Animal caretakers that are ill should not be in the nursery.

An isolette should be available for potential intensive care. If used, keepers should maintain continual contact with the infant by placing hands on the infant through isolette openings. The area outside the isolette should have sufficient climbing opportunities (mesh and climbing structures) for strengthening motor skills, and a scale is necessary for obtaining daily weight data.

Pre-birth preparations: One month before the impending birth, management preparations should begin. The nursery area should be cleaned and disinfected in case it is needed. Appropriate milk-substitute formulas should be ordered (e.g., Enfamil and Similac, or the soy-based Isomil if the infant is allergic to milk protein or lactose – see Porton 1992). Small quantities of 5% glucose, sterile water, and Pedialyte should also be purchased, as these may be necessary to mix with or substitute for formula. At this time, it is also recommended to create a tentative staffing schedule for three 8-hour shifts that provide 24-hour coverage. Twenty-four hour care should be provided from the time the infant is pulled from the dam until it is returned to the mother or a surrogate.

Record keeping: Record keeping is an integral part of the nursery protocol. Keepers should record behaviors, development of motor skills, food consumption, sleep patterns, and milestone information such as tooth eruption. Information on the stool (e.g., color, consistency, and amount) should also be recorded. The first two weeks after the infant has been pulled, vitals should be taken between each bottle-feeding, while the infant is in a quiet mode or asleep. If the infant is active, this procedure is too stressful for both infant and caretakers. By the third week, and if the infant is stable, vitals should be taken once each shift at approximately the same time each day. Taking vitals consistently establishes a pattern. When there is a deviation to this pattern, it may be an indication that something is wrong. A follow up on unstable vitals can lead to early diagnosis, treatment, and a quicker recovery. These records also give a guideline for future nursery infants. When the infant sleeps through the night, vitals can be discontinued on this shift. Table 7 provides a sample of vital information to be recorded during hand-rearing.

Table 7: Information to be recorded in routine infant assessments during hand-rearing

Procedure	Notes
Weight	Taken each morning before feeding by placing infant on its stomach. The diaper should be removed. Infant can hold blanket for security if additional weight is subtracted.
Resting respiration	Infant's breathing should be visually watched, or hand placed on back or stomach. Breaths for 15 seconds should be counted using a watch or clock, and multiplied by 4 for respirations per minute.
Resting pulse	Infant stethoscope should be used on infant's chest; and each heart beat counted for 15 seconds and total multiplied by 4 for pulse per minute.
Resting temperature	A digital thermometer should be used to take temperature under the arm. Veterinarians should be alerted, and measures taken more frequently, when temperatures over 37.8°C (100°F) are recorded.
Girth	With diaper off, a measuring tape with centimeters should be used to circle the waist. Top of tape should touch bottom of navel. When performed consistently, procedure can be used to indicate gastric distension.

Caregivers should be alert for physical and physiological signs of concern, such as loose stools, constipation, increased girth size, increase in temperature, cough/congestion, nasal mucous, changes in normal pulse or respiration, dull hair coat, weight loss, and a white coating on the tongue. Behavioral indicators of concern include the infant not gripping the keeper, excessive clinging, loss of appetite, lethargy, decrease in activity, and excessive vocalizations. In these cases, a veterinarian should be notified immediately.

Feeding protocol: The infant should be bottle-fed formula every 2-3 hours for approximately 3 months. Small amounts of human infant electrolyte solution (e.g., Pedialyte) (about ½ the volume of the formula) can be fed in-between feedings if the infant becomes hungry. Bottle-feedings can be given once every 4 hours as solid foods are added. If infants are to be introduced to a surrogate female, the infant should be fed a bottle through wire mesh as early as 2 months old. This will help the infant become comfortable with this type of feeding, as this is the only way the infant can be fed after the introduction to the surrogate. The infant should be held close to the caretaker's heart, and fed slowly to prevent aspiration. This nursing position emulates the normal ventral/ventral (V/V) position of the dam, but will change as the infant gets older.

Solid foods: Before solid foods are offered, the infant can be shown animal caretakers or conspecifics eating, or if necessary, video of other apes eating. Having food around in the exhibit to be smelled and touched, even if not eaten, should be part of the learning process. Solids foods can be fed when interest is shown and the infant's teeth begin to erupt. Large pieces of raw carrot and celery may be offered for teething. Soaked primate biscuits in formula can be given first, followed by soft vegetables and fruit (such as cooked sweet potatoes, cooked carrots, and bananas). Approximately 1-2 g (0.04-0.07 oz) of each new food can be offered until acceptance, and then portions can be increased in 5 g (0.18 oz) increments. During feeding, the infant should be held in an upright position. Small bites should be smashed between fingers and put in the infant's mouth. Soft species-appropriate food vocalizations (grunts) can be made during eating. When the infant has mesh access to the other chimpanzees, food can be scattered along both sides of the mesh. The infant can watch the other chimpanzees eat and hear them vocalize while eating near them. When keepers are hand-feeding the group, they can also feed the infant through the mesh.

Human-animal interactions: For the first few weeks of life, the infant should be carried constantly to provide warmth and contact. It should be held close to the left side of the keeper's chest, near the heart. The keeper should hold or stay in close contact with the infant while performing nursery tasks. If anything necessitates removing the infant from the keeper's body (diaper change, weighing etc.), it should be placed in a safe location on its stomach, holding a fuzzy toy or blanket.

As the infant becomes older and aware of its surroundings, it should be given the choice to climb off and move around. Even then, the keeper should remain close through touching and voice contact. When there is a staff change, the transfer should be calm and slow. The infant will become more accepting of any new experience or situation because of its close contact with the keeper.

When interacting with the infant, the animal keepers should be quadrupedal as much as possible. This allows the infant an opportunity to grab the keeper's arms or legs so they can locomote together. As the infant grows older, the infant can be carried on the keepers' backs as they crawl around. Kneepads should be worn by the keepers to prevent joint discomfort.

Socialization: It has been suggested that infants being nursery-reared are better socialized later in life when raised with conspecifics. King and Mellen (1994) reported that early rearing experience is a key factor in predicting future

reproductive success. Infants removed from their mothers before two years of age frequently failed to exhibit functional reproductive behavior as adults. Chimpanzees reared in social isolation frequently failed to exhibit the appropriate behaviors that could eventually be incorporated into copulatory behavior (Rogers and Davenport 1969; Davenport and Rogers 1970). In contrast, infants housed in groups with females experiencing menstrual cycles, and/or displays of copulatory behavior, showed an increased likelihood of exhibiting normal copulatory behavior as adults. These studies suggest that early learning can strongly influence the eventual expression of functional reproductive behavior (Bettinger and DeMatteo 2001).

There are conflicting reports regarding how early rearing experience influences the subsequent development of maternal competency. King and Mellen (1994) reported that early experience affected reproductive and maternal competence in zoo-housed chimpanzees, while Toback et al. (1992) reported no effect of rearing history on maternal competence. Bloomsmith et al. (1991) indicated that at least 18 months with the mother seemed critical. Variables such as parity, alloparenting, opportunity, and length of time spent with her mother may also influence a female chimpanzee's tendency to exhibit competent maternal care of her infant (Bettinger and DeMatteo 2001).

The infant has the best chance of becoming socialized if it is introduced to conspecifics at an early age. This may require that zoos and aquariums cooperate by sending out or receiving infants that need to be hand-reared. Peer companionship allows the infants to safely socialize with conspecifics while still dependent on human care (Porton 1992). Due to the strong bond that develops in male chimpanzees, infant males raised together should remain together to form the core of a breeding group as adults (McNary 1992). Note that peer-rearing by itself (i.e., only peer-rearing) should be used only if no appropriate surrogate can be identified. Careful attention should be given to providing the young chimpanzee with a stimulating and challenging environment. The AZA Chimpanzee SSP strongly advocates that an area within the actual ape facility should be set aside or constructed for the infant so they can grow up near adults at an early age (Porton 1992).

Re-socialization and reintroductions: It is crucial for a hand-reared infant to develop a normal repertoire of species-appropriate social behaviors early on. If possible, socialization back to the mother should be done within 6 months. It may be necessary to apply operant condition techniques to train the mother to allow an infant of this age to be bottle-fed. If an infant cannot be reintroduced to its mother, and is to be introduced to another group member or another group, this should be done as early as 18 months (McNary 1992).

It is critical to evaluate the appropriateness of pairings with these young infants. Ultimately, if there is no individual in a group who responds to the infant's needs, and the infant's psychological well-being is at stake, then the infant may need to be introduced to another group. The initial introduction of these younger infants should be to a female who has demonstrated a strong propensity for maternal care or, in the absence of this, an adult or adolescent female who has shown strong "aunting" behavior towards siblings or other young chimpanzees in the group (McNary 1992).

During re-socialization attempts, contact with the caregiver staff will be important to the infant for security, but should be gradually decreased as the surrogate mother takes over. The infant should be allowed access to an area where it cannot be reached by the adult chimpanzees. The process may be slowed down if the infant begins to show signs of duress. Loss of appetite, sudden changes in normal behavior patterns, excessive temper tantrums, and constant loose stools could all be signs that the infant may need a rest from the introduction process. Even an infant who has remained energetic and enthusiastic will need an occasional time out to relax (McNary 1992).

7.5 Contraception

Many animals cared for in AZA-accredited zoos and aquariums breed so successfully that contraception techniques are implemented to ensure that the population remains at a healthy size.

The three general approaches to prevent reproduction are: 1) separation of the sexes, 2) reversible contraception, and 3) permanent sterilization. The decision to perform any permanent contraception should be made in coordination with the AZA Chimpanzee SSP. Since chimpanzees are a social species, separation of the sexes is not generally recommended. The following information summarizes reversible contraception and permanent sterilization methods for chimpanzees. More details on products, application, and ordering information can be found on the AZA Wildlife Contraception Center (WCC) webpage: www.stlzoo.org/contraception.

Surgical sterilization can provide an effective, low cost form of contraception, but in many cases a reversible short-term method may be preferred. Reversible contraceptives such as implants, pills, injectables, and intrauterine devices (IUD), can provide control of reproduction with select individuals while maintaining species-typical behavior within a group. Not all reversible contraceptives permit the maintenance of normal behavior. It is important to balance the efficacy, safety, and method of delivery for a contraceptive with the particular animal's age, reproductive status, and the potential ramifications of the regimes on social behavior (Bettinger and DeMatteo 2001). Because of the profound effects on the normal sociosexual behavior of chimpanzees, genital swelling should not be completely eliminated by the contraceptive option elected. In considering contraceptive options, both genders should be evaluated to permit prevention of pregnancy while minimizing impact on group behavior. It is important to consider reversibility and safety of these options as well as the tendency of weight gain observed with the hormonal methods of contraception.

Oral contraceptives: Oral contraceptives ("birth control pills") are the same products utilized for human females with a combination of synthetic progestin and estrogen (see Table 8). It is important to note that the human menstrual cycle is shorter at 28 days, but the typical to higher-dose products can be prescribed successfully for chimpanzees at this dose frequency. Oral contraceptives are reported with a <4% failure rate in chimpanzees. In addition to good contraception, these products are rapidly cleared by the body following discontinuation, and so are rapidly reversible. In some cases, minimal to moderate impact on the cyclic intumescence is seen in females on this method of contraception with various degrees of swelling and breeding behavior possible. However, without a pill-free or placebo week, as with newer products such as Seasonale®, swelling and sexual behavior are more likely to be suppressed. It is critical that the female receive this product daily, consistently at the same time of day, and completely without refusal, for optimal pregnancy prevention. Chimpanzees can be experts at secreting pills offered, and so complete consumption should be assured, and the training maintained by utilizing the package placebos. When a pill is missed, a second dose should be administered promptly, and if one day is entirely missed, two doses should be offered within 24 hours to maintain efficacy. A side effect of concurrent antibiotic administration, particularly by the oral route, may be reduced efficacy of oral contraceptives.

Concern in regard to oral contraceptives administered during the postpartum interval is limited to its impact on lactation rather than passage of active hormones through the milk to the offspring. By waiting until the infant is one year of age – or demonstrating substantial solid food intake, the impact of possible reduction of milk is minimized. If birth control for adult females is absolutely necessary during this first year of age, low-dose progesterone oral contraceptives or other progestin-only method such as Depo-Provera® or MGA implants can be used, and then the female rotated to the more standard estrogen-progestin combination pill after this time.

Table 8: Birth control pill brands used in female chimpanzees reported to the AZA Wildlife Contraception Center

Brand name	Composition (mg)
Combination Pills	
Lo-Ovral	0.3 Norgestrel / 0.03 Ethinyl estradiol
Ortho-Novum 1/35	1.0 Norethindrone / 0.035 Ethinyl estradiol
Ortho-Novum 1/50	1.0 Norethindreon / 0.05 Ethinyl estradiol
Ortho-Novum 7/7/7	0.5-1.0 Norethindrone / 0.035 Ethinyl estradiol
Ovcon 35	0.4 Norethindrone / 0.035 Ethinyl estradiol
Ovcon 50	1.0 Norethindrone / 0.05 Ethinyl estradiol
Necon 1/35	1.0 Norethindrone / 0.035 Ethinyl estradiol
Necon 1/50	1.0 Norethindrone / 0.05 Mestranol
Ovral 28	0.5 Norgestrel / 0.05 Ethinyl estradiol
Ovranette	1.5 Levonorgestrel / 0.03 Ethinyl estradiol
Modicon 28	0.5 Norethindrone / 0.035 Ethindyl estradiol
Loestrin 1/20	1.0 Norethindrone / 0.02 Ethinyl estradiol
Mercilon	1.5 Desogestrel / 0.02 Ethinyl estradiol
Microgynon 30	1.5 Levonorgestrel / 0.03 Ethinyl estradiol
Alesse 28	0.1 Levonorgestrel / 0.02 Ethinyl estradiol
Yasmin	3.0 Drospirenone / 0.03 Ethinyl estradiol
Progesterone Only Pills	
Femulen	0.5 Ethynodiol Diacetate
Micronor	0.35 Norethisterone
Nor-QD	0.35 Norethindrone
Microlut	0.3 Levonorgestrel

Synthetic progestins: Parenteral progesterone analogues (MGA implants and intramuscular Depo-Provera®) share the same contraceptive mechanism of interference with fertilization by thickening cervical mucus, interrupting gamete transport, and disruption of implantation. It is important to note that ovulation and cycling can occur, and the degree of suppression is dose dependent. The AZA WCC database maintains that 29% of the female chimpanzees have utilized a solid silastic implant (melengestrol acetate, MGA) with a 4% failure rate, while the Norplant (levogestrol) implant is no longer utilized in human medicine due to repeated failures as the product approaches the end of its five-year cycle. Although these products are good contraceptives, and do not require daily medication events, a surgical procedure is required to place some of these products, except the Depo-Provera® injection. Implants should be routinely checked as in place by palpation during training, or scanning a transponder microchip placed within implant. Unlike the oral contraceptives, the parenteral progesterones tend to gradually eliminate perineal intumescence with accompanying negative social side effects, although the return of visible cycling can be used as a marker of reduced contraceptive efficacy.

Depo-Provera®: The recommended dose is 2.5-5 mg/kg body weight every 2-3 months, respectively. Although the majority of females on Depo-Provera® do not exhibit genital swelling, a few females have been reported to exhibit reduced levels of swelling. The onset of genital swelling in a female on Depo-Provera® should alert managers that the female is no longer receiving contraceptive protection and may have resumed cycling (Bettinger and DeMatteo 2001). Time to reversal varies greatly among females and can be as long as 2 years. It may be best used as an interim contraceptive method.

Implanon®: This single-rod implant containing another synthetic progestin etonogestrel was recently approved for sale in the U.S. It may be effective for as long as 3 years, but replacement every 2 years is a more cautious recommendation.

MGA implant: The MGA (melengestrol acetate) is specifically formulated for each species, and contained in a single silastic implant inserted intramuscularly or subcutaneously between the scapulae. Although some genital swelling may occur, it is more common for chimpanzee subjects on MGA not to exhibit swelling. Females have been reported to resume normal cycling within a few weeks, and pregnancy can occur quickly following the removal of an MGA implant (Bettinger and DeMatteo 2001) though it may take longer.

Mechanical contraception: Mechanical contraception (intrauterine devices or IUDs) causes irritation to the endometrium to prevent implantation of an embryo. Anesthesia and meticulous procedure is required to place these devices and the retrieval threads have to be cut short to prevent voluntary removal. Higher contraception failures are reported with IUD use, including spontaneous expulsion of the devices, particularly from young, nulliparous animals.

Permanent sterilization: Permanent sterilization of females can be accomplished by ovariohysterectomy (OHE) and tubal ligation. OHE should be considered in only those females with reproductive tract pathology. The chimpanzee pelvic canal is very deep, and splitting the pelvic symphsis may be required to access the uterus fully during an OHE. In

situations where uterine fibromas (leiomyomas) are present, complete removal of the ovaries is necessary to prevent recurrence with potential fatal consequences.

Gonadotropin releasing hormone (GNRH) agonists: Both genders may be contracepted with a new experimental contraceptive category, gonadotropin releasing hormone (GnRH) agonists (Suprelorin®: deslorelin; and Lupron Depot®: leuprolide acetate). These products act by first over-stimulating then suppressing FSH and LH from the anterior pituitary gland through receptor down-regulation. It is important to note that the initial effect of these products is to stimulate the reproductive system, so adequate contraception should be in place during the stimulation phase. Ultimately, contraception occurs with a subsequent decrease in testosterone and sperm production for males that is expected with a concurrent reduction in aggression. This side effect may allow another use of these products in group aggression management. Decrease in estrogen and progesterone with ovulation suppression is expected in the female. Success and failure rate has not been determined yet for chimps, nor is the impact on normal sociosexual behavior known. Further research is warranted for the use of this contraceptive in chimpanzees of both sexes.

Male contraception: Male contraceptive efforts have the advantages of minimizing impact on the group's cycling females, including preventing their weight gains. Male contraception is also a consideration for multi-male breeding groups to permit selection of paternity.

Permanent/semi-permanent contraception: Permanent or semi-permanent contraception can be accomplished through vasectomy that severs the vas deferens to prevent sperm passage from the testes to the penile urethra. Note that the testicular side of the vas deferens should be sutured to prevent recanalization. As this is not castration, which is only recommended in testicular pathology, hormonal profiles remain intact so the male libido and sexual interactions should be unaffected. With appropriate surgical technique, the deliberate reversibility of the technique can be improved while preventing unintentional, spontaneous recanalization and return to fertility. Although this procedure requires immobilization and surgery, it is routine in approach. Vasectomies should be performed by a veterinarian experienced in the procedure, as there have been several cases of failed procedures. Histological confirmation of sperm in the vas deferens is advisable. Reversibility has yet to be confirmed possible in chimpanzees.

Vas plugs: Vas plugs of silastic material have only been used in a few animals with inconsistent results. Concerns of permanent sterility even following removal, or failure to block transfer of viable sperm to the urethra have both been encountered.

8.1 Animal Training

Classical and operant conditioning techniques have been used to train animals for over a century. Classical conditioning is a form of associative learning demonstrated by Ivan Pavlov. Classical conditioning involves the presentation of a neutral stimulus that will be conditioned (CS) along with an unconditioned stimulus that evokes an innate, often reflexive, response (US). If the CS and the US are repeatedly paired, eventually the two stimuli become associated and the animal will begin to produce a conditioned behavioral response to the CS.

Operant conditioning uses the consequences of a behavior to modify the occurrence and form of that behavior. Reinforcement and punishment are the core tools of operant conditioning. Positive reinforcement occurs when a behavior is followed by a favorable stimulus to increase the frequency of that behavior. Negative reinforcement occurs when a behavior is followed by the removal of an aversive stimulus to also increase the frequency of that behavior. Positive punishment occurs when a behavior is followed by an aversive stimulus to decrease the frequency of that behavior. Negative punishment occurs when a behavior is followed by the removal of a favorable stimulus also to decrease the frequency of that behavior.

AZA-accredited zoos and aquariums are expected to utilize reinforcing conditioning techniques to facilitate husbandry procedures and behavioral research investigations.

The use of positive reinforcement training as an animal care and management tool offers many benefits for chimpanzees and staff. One of the greatest benefits is to gain the voluntary cooperation of the chimpanzees in husbandry, veterinary, and research procedures. The fear associated with these procedures, as well as the need for restraint and anesthesia, can be significantly reduced. Greater choice and control can be provided to trained chimpanzees, contributing to their psychological well-being (Laule and Whittaker 2001). Examples of key behaviors to be trained are:

- **Station**: Chimpanzee holds place at a specified location, which may be identified with a station marker such as a colored piece of PVC tubing that is distinguishable from other markers in use.
- **Shifting**: Chimpanzee moves from one location to another upon command. This may be prompted with station markers, laser pointers, or other indicators.
- **Body present**: Chimpanzee provides access to specific body parts through a mesh barrier to allow a keeper's touch or visual inspection without interference. Common body items that are easily trained are shoulder, head, ear, arm, leg, back, and open mouth.
- **Cooperative feeding**: A dominant chimpanzee holds its location while a conspecific is fed. In most cases, the dominant animal is provided their meal first, and is then reinforced additionally for not interfering with the other feeding.
- **Injection**: Chimpanzee is trained to tolerate the presence of a syringe and needle to the point of the blunted end touching his shoulder. This training can progress to the point of faux injections that simulate real medical procedures, and actual injections.

Using operant conditioning techniques, chimpanzees can be desensitized to frightening or painful events, such as receiving an injection, so that the event becomes less frightening and less stressful (Laule and Whittaker 2001). Voluntary cooperation reduces the need for physical restraint and/or anesthesia, and the accompanying risks associated with those events (Bloomsmith 1992; Reinhardt et al. 1995). The following trained behaviors are recommended for advanced chimpanzee husbandry programs:

- **Blood draws and injections**: Many facilities are designed to accommodate blood draws by the use of a steel or strong plastic pipe sleeve attached to enclosure barriers. Chimpanzees can be trained to insert their arms into the sleeve and allow blood draws or injections. These sleeves can be removed when not in use (Coe et al. 2001). The use of the sleeve allows the staff access to the chimpanzee in a relatively safe manner. Chimpanzees can also be trained to present body parts against a mesh barrier to accommodate vaccines, anesthesia, and insulin injections.
- **Medical procedures**: Chimpanzees can be trained to cooperate during medical procedures, such as presenting the chest for the use of a stethoscope, or an ear for the use of a thermometer. Additionally, chimpanzees can be trained to present their belly so that ultrasounds can be performed.
- **Scales**: Weighing individuals periodically can help detect illness or physiological changes that can affect overall health. Weighing stations may be built-in features within runways, or freestanding scales may be rolled into place. A scale attached to a climbing rope can also be used. Using these approaches, weights can be obtained without sedating the chimpanzees (Coe et al. 2001).
- **Urine collection**: A regular collection of urine can be used to monitor the reproductive cycle, stress, and other health indicators of chimpanzees. Urine collection can be facilitated by the construction of a trough or specialized drain that chimpanzees can be trained to use (Coe et al. 2001), or by providing areas where chimpanzees can be trained to urinate on command into a small receptacle held by the trainer.

Animal management and enclosure design: Specific enclosure designs recommended to promote successful training programs within chimpanzee facilities should include:

- Good visual access of animals in all areas
- Multiple access points to animals both on and off exhibit
- Multiple shifting points to allow access to animals as they are moved through the facility
- Built in mounts for husbandry and medical apparatus, such as blood collection sleeves or urine collection pans
- Large mesh access points for safe treatment of wounds or delivery of injections
- Multiple and connected off-exhibit areas with no dead ends (Laule 1995)

A safe means to provide close contact between caregivers and apes should be devised for each situation. Ports that can be opened during training sessions can provide more access to the chimpanzees. The type of barrier will also affect access. Some trainers prefer mesh with openings as large as 7 cm x 7 cm (3 in x 3 in) so that objects of this size can be passed through. However, 5 cm x 5 cm (2 in x 2 in) mesh is more commonly provided. Each institution should accept responsibility for the possible risks inherent in their choice of materials and opening sizes (Coe et al. 2001).

8.2 Environmental Enrichment

Environmental enrichment, also called behavioral enrichment, refers to the practice of providing a variety of stimuli to the animal's environment, or changing the environment itself to increase physical activity, stimulate cognition, and promote natural behaviors (specifically prosocial behavior such as social grooming and playing, increased activity and exploration). Stimuli, including natural and artificial objects, scents, and sounds are presented in a safe way for the animals to interact with. Some suggestions include providing food in a variety of ways (i.e., frozen in ice or in a manner that requires an animal to solve simple puzzles to obtain it), using the presence or scent/sounds of other animals of the same or different species, and incorporating an animal training (husbandry or behavioral research) regime in the daily schedule.

It is recommended that an enrichment program be based on current information in biology, and should include the following elements: goal-setting, planning and approval process, implementation, documentation/record-keeping, evaluation, and subsequent program refinement. Environmental enrichment programs should ensure that all environmental enrichment devices (EEDs) are safe and are presented on a variable schedule to prevent habituation AZA-accredited zoos and aquariums must have a formal written enrichment program that promotes species-appropriate behavioral opportunities (AZA Accreditation Standard 1.6.1).

AZA accreditation standard

(1.6.1) The institution must have a formal written enrichment program that promotes species-appropriate behavioral opportunities.

Enrichment programs should be integrated with veterinary care, nutrition, and animal training programs to maximize the effectiveness and quality of animal care provided. AZA-accredited zoos and aquariums must have specific staff members assigned to oversee, implement, train, and coordinate interdepartmental enrichment programs (AZA Accreditation Standard 1.6.2).

AZA accreditation standard

(1.6.2) The institution must have a specific staff member(s) or committee assigned for enrichment program oversight, implementation, training, and interdepartmental coordination of enrichment efforts.

There are several sources of good information on potential chimpanzee enrichment interventions. Contact the Chimpanzee SSP Coordinator for more information. Appendix H shows an example of an approved enrichment list. Note that each form of enrichment is categorized for use within a standardized enrichment schedule (see Appendix I).

The following information on chimpanzee enrichment is closely adapted from the section written by Mellen and Shepherdson (1992) within the 'Chimpanzee Husbandry Manual' (Fulk and Garland 1992).

Husbandry routine: Husbandry routines (e.g., cleaning regime, feeding schedule, moving of animals), when varied from day-to-day, can be an interesting and enriching component of the chimpanzees' environment in zoos and aquariums. Whenever possible, the management of chimpanzees should include the principle that they be allowed to control a substantial part of their daily routine and events, (e.g., who they are with/not with, where they are, when and what they eat) (Rumbaugh et al. 1989).

Manipulatable objects: (permanent and temporary): Since the predominant daytime activity of wild chimpanzees is searching for and consuming food (approximately 50-60% of their time), great efforts should be made to increase the amount of time chimpanzees in zoos and aquariums spend in similar endeavors. Providing a variety of manipulatable objects to chimpanzees both increases the amount of time spent in foraging-type activities (e.g., with food retrieval devices such as termite mounds), and presumably increases their well-being. It may be the case that naturalistic objects are preferred in exhibit areas; while in off-exhibit areas, no such restrictions are deemed necessary (McMillan et al. 1991). Note that any objects provided to the chimpanzees should be carefully checked to ensure they are safe for use. For instance, sharp edges should be removed, holes in which limbs or fingers might become stuck should be altered, and all materials used should be assured to be non-toxic.

In an evaluation of great ape enclosures, Wilson (1982) measured the influence of a number of factors on the behavior of apes, namely: enclosure size, usable surface area, frequency of feeding, number of animals per enclosure, and number and type of objects available. The factors most closely associated with activity were the number of companions and the presence of objects. These results once again support the view that size alone is not the most important component of a successful exhibit. Rather, the social environment, the presence of manipulatable objects, and an imaginative and varied husbandry routine appear to be more important.

The effect of a variable schedule of reinforcement has been shown with many species and with feeding schedules for chimpanzees specifically (Bloomsmith and Lambeth 1995). The same approach should be taken with scheduling enrichment. Enrichment provided on a variable schedule (different times on different days) may be more effective than if it were presented every day at the same time.

Novelty: The responses of chimpanzees to enrichment initiatives are subject to habituation. Resistant enrichment initiatives are those that have an inherent amount of complexity/variability, and those that permit chimpanzees to perform some natural activity (e.g., nesting, foraging) (van Hooff 1967). Presumably, the greater the number and variety of novel objects presented at any one time, the lower the rate of habituation. Menzel (1971) found that interest in novel objects that were portable and/or flexible sustained interest longer in young chimpanzees than items that were neither. Interestingly (and not surprisingly), destructible toys are more effective in maintaining interest than continual exposure to indestructible toys (Bloomsmith et al. 1990), and these are often utilized more by young animals than by adults. Items such as cardboard boxes, long sheets of paper towel, carpet rolls, etc., when presented irregularly, can sustain interest and use. Destructible toys may be effective in eliciting use because they offer continual changes in shape and size as they are destroyed, resulting in some level of novelty over time (Brent 2001). Naturalistic objects are preferred by some institutions in the exhibit area; in off-exhibit areas, no such restrictions are deemed necessary (McMillan et al. 1991). Some zoos have no such distinctions. See Schapiro et al. (1991) for a review of use of manipulatable objects as enrichment devices.

Sensory enrichment:

Auditory: There is growing attention paid to the behavioral effects of sensory enrichment (stimuli designed to trigger one or more of an animal's senses such as vision, sound, sight or smell). The relatively common practice of playing radio broadcasts within auditory range of chimpanzees was found to reduce aggression and increase social affiliations in chimpanzees (Howell et al. 2003). Videan et al. (2007) demonstrated that instrumental music was more effective than vocal music in increasing social interactions between laboratory-housed chimpanzees. Furthermore, they found that the speed of the music influenced chimpanzee behavior: slower tempo vocal music was more effective in reducing aggression in male chimpanzees than faster tempo music. There is relatively little, if any evidence, that there is an enriching effect to playing "natural" sounds (i.e., those mimicking chimpanzee environments: jungle noises, etc.) and it is possible that these types of stimulation may even have some negative effects such as those shown with zoo-housed gorillas (Wells et al. 2006). While some auditory stimulation may be enriching, what may be more important is the way in which that sound may reduce other, potentially negative, ambient noise.

Olfactory: The chimpanzee sense of smell is approximately equivalent to that of humans. While not as important as for some other species, there are potential behavior-altering effects to enriching the olfactory environment for chimpanzees. The essential oils of peppermint and/or rosemary have been found to increase the activity level of chimpanzees (Struthers and Campbell 1996). However, Ostrower and Brent (2000) found that the application of "pleasant" (i.e., vanilla, orange, peach) and "unpleasant" (i.e., moth balls, cigar smoke, limburger cheese) odors to fleece cloths elicited no more attention from chimpanzees than did cloths without any added olfactory substances. While olfactory stimulation should not be overlooked as a method of enhancing chimpanzee environments, there is little evidence that broad or clearly positive effects should be expected.

Visual: There has been substantial work on the value of video images as enrichment for chimpanzees. Brent et al. (1989) found that such images reduced some stereotypic behaviors. In another similar study, chimpanzees were found no more likely to watch video of conspecifics or humans than those that were less biologically relevant (Bloomsmith et al. 1990; Bloomsmith and Lambeth 2000). Another common visual stimulus is mirrors, and there is some evidence of behavioral benefit in providing such enrichment (Lambeth and Bloomsmith 1992; Brent and Stone 1996). Note that convex mirrors were used in many of these studies and seem to provide the benefit of allowing chimpanzees to see outside the usual visual scope of their enclosure (i.e., down hallways or into adjacent cages). Finally, the impact of color on chimpanzee behavior has been investigated recently, although the results of this field of study are still unambiguous. Zoo-housed chimpanzees have been shown to prefer blue and green colored stimuli to the same objects colored red (Wells et al. 2008) and anxiety-related pacing has been found to be mitigated by green-lighting in zoo-housed chimpanzees (Fritz et al. 1995).

8.3 Staff and Animal Interactions

Animal training and environmental enrichment protocols and techniques should be based on interactions that promote safety for all involved. Caregiver-chimpanzee interaction is inevitable during the course of the daily care of the

chimpanzees. The relationship that forms between caregivers and chimpanzees influences all aspects of care. The form that relationship takes will depend on a variety of factors, including knowledge of the species, understanding of what the job entails, attitudes and expectations of the caregivers, the behavior of individual chimpanzees, and the tools and techniques a caregiver has to accomplish daily tasks. Bloomsmith et al. (1999) found that both training and less formalized "non-training interactions" between keepers and apes had some behavioral benefit (e.g., decreased agonism and abnormal behaviors, and increased play) during interactions, and in some cases these benefits extended beyond the actual interaction session.

As outlined in Chapter 4, section 4.3, the AZA Chimpanzee SSP advocates a minimum intervention strategy. While this is framed in context of social introductions above, these guidelines are important during day-to-day management as well given that even positively-intended keeper interactions can lead to changes in group dynamics and possibly increased aggression.

Protected contact: The AZA Chimpanzee SSP and AZA Ape TAG strongly recommend 'protected contact' for managing adult apes; there should always be a protective barrier between the ape and the human caregiver. The reasons for this are threefold: 1) safety concerns for the keeper (directed and accidental injuries), 2) short and long-term effects of extended human interaction on the apes (such as maternal, sexual and behavioral effects), and 3) the influence of human interaction on public perception of apes (and their feasibility as pets). Some facilities, both within and outside of AZA, practice free contact with adult apes, but the AZA Chimpanzee SSP recommends that free contact not be part of the regular management strategy for adult apes. In cases where keepers have to have direct contact with apes (such as in a nursery-rearing scenario), the AZA Chimpanzee SSP recommends that these interactions take place with appropriate zoonotic considerations, and not within view of the public.

Safe management protocols: The following list provides recommendations and best practices for the safe management of chimpanzees in zoos and aquariums:

- Detailed Standard Operating Procedures should be written for all daily care protocols that include specific safety requirements.
- Checks and double-checks of all locks, doors, exhibits, and holding facilities should be performed. Locking devices that allow for visual determination of whether a lock or door is secured or not should be installed.
- A procedure for counting chimpanzees in a given area before they are transferred from one area to another should be developed. In most cases, having two keepers working together when chimpanzees are transferred can increase the effectiveness of the transfer. All staff should be aware of the actual reach distance in any area of close proximity to the chimpanzees. No assumptions should be made about the locations of the chimpanzees when shifting or entering an exhibit or holding area. All doubt should be eliminated by double-checking the enclosures. Blind spots or areas of decreased visibility in the holding area should be addressed, and caretakers should be aware of these areas in the exhibit.
- A brightly colored line should be painted down the keeper aisle at the maximum reach distance from the bottom of the containment barrier. This will serve as a reminder to the keepers that the chimpanzees are capable of reaching out and grabbing anything within that line. Lighting in dark areas should be increased, and when possible, video or mirrors installed to provide visual access to blind spots to ensure that a chimpanzee is not hiding. It is important that radios or other devices be provided to the staff to ensure communication in the event of an emergency.
- Enclosures should be examined for large rocks, sticks, or other debris that could potentially be used as a weapon, or a means to escape from the exhibit. All containment barriers and facility structures should be inspected daily, and timely repair of any potential hazards should be performed.
- A program for effective communication should be implemented (see also Chapter 6, section 6.6). This should include a communication system for ensuring that pertinent information is communicated among the staff and supervisors, a system for notifying the appropriate staff in the event of an emergency, and the coordination of the safety program for the chimpanzee area with the safety program of the institution. Emphasis should be placed on establishing and maintaining a high level of alertness among those caring for the chimpanzees.
- Access to any chimpanzee area should be limited to those individuals trained in the proper safety and care procedures, or supervised by those individuals. A secondary containment area should be established to allow any keeper a means of protection in the event of an escape (see also Chapter 2, section 2.2).

Facilities should be designed with the facilitation of operant conditioning training in mind. As such there should be sufficient mesh panels allowing protected contact between keepers/trainers and the chimpanzees. These panels should be as numerous as possible to increase the flexibility of training opportunities, including, if possible, panels at varying heights.

Interactions between keepers/trainers and the chimpanzees should be done with a protective barrier in place. Furthermore, care should be taken to reduce the likelihood of zoonotic disease transmission. Use of masks and latex gloves are recommended when appropriate. Trainer/keepers that are experiencing any illness should abstain from interacting with the apes through mesh. Likewise, care should be taken to reduce the risk of physical injury as

chimpanzees are known to grab fingers, hair, and clothing through the protective barrier. As such, loose-fitting clothing and jewelry should be restrained, replaced or removed and long-hair should be netted, tied back or netted. Care should be taken to be aware of the location of chimpanzees' hands and mouth at all times during training sessions. A commonly used strategy during training is to request that the chimpanzees stay in contact with a target (often a small plastic item such as a pvc elbow joint, which is easily clipped onto the mesh) with their hand. Inserting fingers through the mesh incurs significant risk of biting and as such, we advise that human body parts stay on their side of the mesh.

8.4 Staff Skills and Training

Staff members should be trained in all areas of animal behavior management. Funding should be provided for AZA continuing education courses, related meetings, conference participation, and other professional opportunities. A reference library appropriate to the size and complexity of the institution should be available to all staff and volunteers to provide them with accurate information on the behavioral needs of the animals with which they work.

A well-trained staff that is knowledgeable in species-specific and typical chimpanzee behavior patterns is a prerequisite for accurate observations and daily monitoring, and especially for data collection during the process of introductions and group formation. Staff should have a good working knowledge of chimpanzee behavior to be able to articulate and track the progress of introductions and social interactions before, during, and following the initial introduction and group formation period (Fritz and Howell 2001). Staff should receive training on chimpanzee natural history, behavior, anatomy, occupational health, enrichment, and positive reinforcement training. Additionally, it is critical that all staff be able to reliably identify each individual chimpanzee, and be aware of their individual characteristics and personality traits.

By far the most important element in developing a training program is the ability of the staff to apply positive reinforcement techniques effectively. Training is a skill that takes time and practice to develop. At least one individual should have sufficient training skills in problem solving for difficult situations as they arise, as well as to coordinate and oversee training activities (Laule and Whittaker 2001).

The AZA Chimpanzee SSP maintains a website (www.chimp-ssp.org) which is an excellent resource on programmatic initiatives, information about chimpanzees as well as links to other information sources.

9.1 Program Animal Policy

AZA recognizes many public education and, ultimately, conservation benefits from program animal presentations. AZA's Conservation Education Committee's Program Animal Position Statement (Appendix D) summarizes the value of program animal presentations.

For the purpose of this policy, a program animal is described as an animal presented either within or outside of its normal exhibit or holding area that is intended to have regular proximity to or physical contact with trainers, handlers, the public, or will be part of an ongoing conservation education/outreach program.

Program animal presentations bring a host of responsibilities, including the welfare of the animals involved, the safety of the animal handler and public, and accountability for the take-home, educational messages received by the audience. Therefore, AZA requires all accredited institutions that give program animal presentations to develop an institutional program animal policy that clearly identifies and justifies those species and individuals approved as program animals and details their long-term management plan and educational program objectives.

AZA's accreditation standards require that the conditions and treatment of animals in education programs must meet standards set for the remainder of the animal collection, including species-appropriate shelter, exercise, sound and environmental enrichment, access to veterinary care, nutrition, and other related standards (AZA Accreditation Standard 1.5.4). In addition, providing program animals with options to choose among a variety of conditions within their environment is essential to ensuring effective care, welfare, and management. Some of these requirements can be met outside of the primary exhibit enclosure while the animal is involved in a program or is being transported. For example, housing may be reduced in size compared to a primary enclosure as long as the animal's physical and psychological needs are being met during the program; upon return to the facility the animal should be returned to its species-appropriate housing as described above.

AZA Accreditation Standard

(1.5.4) A written policy on the use of live animals in programs should be on file. Animals in education programs must be maintained and cared for by trained staff, and housing conditions must meet standards set for the remainder of the animal collection, including species-appropriate shelter, exercise, social and environmental enrichment, access to veterinary care, nutrition, etc. Since some of these requirements can be met outside of the primary enclosure, for example, enclosures may be reduced in size provided that the animal's physical and psychological needs are being met.

The AZA Chimpanzee SSP does not consider chimpanzees, of any age, as program animals. As mentioned in section 8.3, we advocate that protected contact be used for any interactions with chimpanzees. Furthermore, the AZA has adopted an important stance on the presentation of animals, specifically with reference to great apes in entertainment (Appendix J).

9.2 Institutional Program Animal Plans

AZA's policy on the presentation of animals is as follows: AZA is dedicated to excellence in animal care and welfare, conservation, education, research, and the presentation of animals in ways that inspire respect for wildlife and nature. AZA's position is that animals should always be presented in adherence to the following core principles:

- Animal and human health, safety, and welfare are never compromised.
- Education and a meaningful conservation message are integral components of the presentation.
- The individual animals involved are consistently maintained in a manner that meets their social, physical, behavioral, and nutritional needs.

AZA-accredited zoos and aquariums which have designated program animals are required to develop their own Institutional Program Animal Policy that articulates and evaluates the program benefits (see Appendix E for recommendations). Program animals should be consistently maintained in a manner that meets their social, physical, behavioral, and nutritional needs. Education and conservation messaging must be an integral component of any program animal demonstration (AZA Accreditation Standard 1.5.3).

AZA accreditation standard

(1.5.3) If animal demonstrations are a part of the institution's programs, an education and conservation message must be an integral component.

Animal care and education staff should be trained in program animal-specific handling protocols, conservation and education messaging techniques, and public interaction procedures. These staff members should be competent in recognizing stress or discomfort behaviors exhibited by the program animals and be able to address any safety issues that arise.

AZA Accreditation Standard

(1.5.5) For animals used in offsite programs and for educational purposes, the institution must have adequate protocols in place to protect the rest of the collection from exposure to infectious agents.

Program animals that are taken off zoo or aquarium grounds for any purpose have the potential to be exposed to infectious agents that could spread to the rest of the institution's healthy population. AZA-accredited zoos and aquariums must have adequate protocols in place to avoid this (AZA Accreditation Standard 1.5.5).

AZA Accreditation Standard

(10.3.3) All animal enclosures (exhibits, holding areas, hospital, and quarantine/isolation) must be of a size and complexity sufficient to provide for the animal's physical, social, and psychological well-being; and exhibit enclosures must include provisions for the behavioral enrichment of the animals.

Careful consideration must be given to the design and size of all program animal enclosures, including exhibit, off-exhibit holding, hospital, quarantine, and isolation areas, such that the physical, social, behavioral, and psychological needs of the species are met and species-appropriate behaviors are facilitated (AZA Accreditation Standards 10.3.3; 1.5.2).

Animal transportation must be conducted in a manner that is lawful, safe, well-planned and coordinated, and minimizes risk to the animal(s), employees, and general public (AZA Accreditation Standard 1.5.11).

9.3 Program Evaluation

AZA-accredited zoos and aquariums which have Institutional Program Animal Plan are required to evaluate the efficacy of the plan routinely (see Appendix E for recommendations). Education and conservation messaging content retention, animal health and well-being, guest responses, policy effectiveness, and accountability and ramifications of policy violations should be assessed and revised as needed.

AZA Accreditation Standard

(1.5.2) Animals should be displayed, whenever possible, in exhibits replicating their wild habitat and in numbers sufficient to meet their social and behavioral needs. Display of single specimens should be avoided unless biologically correct for the species involved.

AZA Accreditation Standard

(1.5.11) Animal transportation must be conducted in a manner that is safe, well-planned and coordinated, and minimizes risk to the animal(s), employees, and general public. All applicable local, state, and federal laws must be adhered to.

10.1 Known Methodologies

AZA believes that contemporary animal management, husbandry, veterinary care and conservation practices should be based in science, and that a commitment to scientific research, both basic and applied, is a trademark of the modern zoological park and aquarium. AZA-accredited zoos and aquariums have the invaluable opportunity, and are expected to, conduct or facilitate research both in *in situ* and *ex situ* settings to advance scientific knowledge of the animals in our care and enhance the conservation of wild populations. This knowledge might be achieved by participating in AZA Taxon Advisory Group (TAG) or Species Survival Plan® (SSP) sponsored research, conducting original research projects, affiliating with local universities, and/or employing staff with scientific credentials (AZA Accreditation Standard 5.3).

AZA Accreditation Standard

(5.3) Institutions should maximize the generation of scientific knowledge gained from the animal collection. This might be achieved by participating in AZA TAG/SSP sponsored research when applicable, conducting original research projects, affiliating with local universities, and/or employing staff with scientific credentials.

Chimpanzees are highly endangered in the wild, are biologically more similar to humans than any other species, and exhibit among the broadest behavior and cognitive repertoires of any animal housed in zoological settings. For these three reasons, research and conservation of and for chimpanzees should be prioritized. Chimpanzees, including all subspecies and hybrids of *Pan troglodytes* (but not including *Pan paniscus*) are cooperatively managed by the AZA Chimpanzee SSP. Along with other ape taxa, the AZA Chimpanzee SSP falls under the oversight of the AZA Ape TAG. Due to their behavioral similarities, the AZA Gorilla SSP, Bonobo SSP, Orangutan SSP and Gibbon SSP work closely together to identify shared goals and resources.

Because chimpanzees are housed in a wide variety of settings, there are numerous potential collaborating institutions and resources (see Table 9). Here we list some of the more prominent conservation organizations, though inclusion on this list does not infer endorsement of collaboration by the AZA Chimpanzee SSP or AZA. For more information on other resources and collaborative facilities, contact the AZA Chimpanzee SSP Coordinator.

Table 9: Great Ape Resources and Collaborative Facilities

Chimpanzee Conservation	
Goualougo Triangle Ape Project	www.congo-apes.org
Bossou-Nimba Chimpanzee Research Project	www.greenpassage.org/indexE.rhtml
Gombe Stream Research Center	www.janegoodall.org/chimpanzees-gsrc
Budongo Conservation Field Station	www.budongo.org
Fongoli Savanna Chimpanzee Project	http://savannachimp.blogspot.com/
Kibale Chimpanzee Project	www.fas.harvard.edu/~kibale/
Mahale Mountains Chimpanzee Research Project	http://jinrui.zool.kyoto-u.ac.jp/others/WelcomeE.html
Taï Chimpanzee Project	www.eva.mpg.de/primat/files/chimps.htm

Research investigations, whether observational, behavioral, physiological, or genetically based, should have a clear scientific purpose with the reasonable expectation that they will increase our understanding of the species being investigated and may provide results which benefit the health or welfare of animals in wild populations. Many AZA-accredited zoos and aquariums incorporate superior positive reinforcement training programs into their routine schedules to facilitate sensory, cognitive, and physiological research investigations and these types of programs are strongly encouraged by the AZA.

Examples of research conducted with chimpanzees:

- Bipedalism
- Brain imaging
- Cognition
- Culture
- Development
- Ecology
- Endocrinology
- Enrichment
- Epidemiology
- Facial recognition
- Genetics
- Genome
- Habitat use
- Handedness
- Human-animal interactions
- Language
- Laterality
- Nutrition
- Observational behavior
- Physiology
- Symbolic representation
- Theory of Mind
- Tool-use
- Touch Screen
- Training
- Vocalizations
- Diseases

AZA-accredited zoos and aquariums are required to have a clearly written research policy that identifies the types of research being conducted, methods used, staff involved, evaluations of the projects, the animals included, and guidelines for the reporting or publication of any findings (AZA Accreditation Standard 5.2). Institutions must designate a qualified individual designated to oversee and direct its research program (AZA Accreditation Standard 5.1). If institutions are not able to conduct in-house research investigations, they are strongly encouraged to provide financial, personnel, logistical, and other support for priority research and conservation initiatives identified by Taxon Advisory Groups or Species Survival Plans®.

AZA Accreditation Standard

(5.2) Institutions must have a written policy that outlines the type of research that it conducts, methods, staff involvement, evaluations, animals to be involved, and guidelines for publication of findings.

AZA Accreditation Standard

(5.1) Research activities must be under the direction of a person qualified to make informed decisions regarding research.

Institutions should adhere to research standards set by AZA, their local, state, and federal legislation as well as their own internal policy. Research with chimpanzees should always consider the potential effect on individual wellbeing as well as group dynamics. Because chimpanzees are housed at a wide variety of facilities (zoos, sanctuaries, research facilities, private ownership), care should be given to selecting appropriate research partners and the care that they provide for their chimpanzees. We recommend that any studies get research review and endorsement from the AZA Chimpanzee SSP and/or AZA Ape TAG. We recommend that research projects do not endorse or otherwise facilitate (financially or otherwise) chimpanzees held in private ownership.

10.2 Future Research Needs

This Animal Care Manual is a dynamic document that will need to be updated as new information is acquired. Knowledge gaps have been identified throughout the Manual and are included in this section to promote future research investigations. Knowledge gained from areas will maximize AZA-accredited zoos and aquariums' capacity for excellence in animal care and welfare as well as enhance conservation initiatives for the species.

Chapter 1. Ambient Environment

Section 1.4 Sound and Vibration: It may be possible that the concentration of sound through reverberation may lead to stimulation of apes during displays, but there are no data to confirm this speculation.

Chapter 4. Social Environment

Section 4.1. Group Size and Structure: There is no conclusive evidence to suggest a maximum number of adult males that can coexist with each other in single-sexed groups, nor is there good data on how these all-male groups differ behaviorally from mixed-sex groups. Additional research is needed to gather more evidence on this topic.

Chapter 5. Nutrition:

Section 5.1. Nutritional Requirements: Although daily human caloric needs can be a guide for this species, NRC guidelines were published recently for non-human primates (NRC 2003). More research is needed to identify specific nutrient requirements for chimpanzees. The degree of variation in body size of chimpanzees is relatively small once factors of sex, age, and health (e.g., obesity) are removed. As a result, there are no conclusive dietary recommendations for chimpanzees of different size. Further research will help clarify this issue.

Chapter 7. Reproduction

Section 7.5. Contraception: Both genders may be contracepted with a new experimental contraceptive category, gonadotropin releasing hormone (GnRH) agonists (Suprelorin®: deslorelin; and Lupron Depot®: leuprolide acetate). These products act by first over-stimulating then suppressing FSH and LH from the anterior pituitary gland through receptor down-regulation. Ultimately, contraception occurs with a subsequent decrease in testosterone and sperm production for males that is expected with a concurrent reduction in aggression. This side effect may produce another use of these products in group aggression management. Decrease in estrogen and progesterone with ovulation suppression is expected in the female. Success and failure rate has not been determined yet for chimpanzees, nor is the impact on normal sociosexual behavior known. Further research is warranted for the use of this contraceptive in chimpanzees of both sexes.

Other Research Needs

Policy and private-ownership. Chimpanzees live in a variety of settings besides zoological parks, many of which are relatively unregulated in terms of standards of care, including pet ownership, “entertainment” facilities, circuses, seller/breeders and unaccredited zoos (see www.chimpcare.org). The longterm effects of these atypical early histories is unknown and research into these areas should take place. Likewise, planning for the future policy change in which private ownership is legislatively prohibited in an important consideration. Development of strategic planning to expand sustainable housing options for chimpanzees is a critical issue to be investigated.

Behavior and well-being: Future research is needed on the behavioral management of chimpanzees, and on the psychological well-being of chimpanzees in zoos and aquariums. The management of large social groups including managing aggression, modeling fission/fusion social organization in zoos and aquariums, introductions of young, nursery-reared chimpanzees to large social groups, and the effects of reduced reproduction on behavior all require further study. To promote the psychological well-being of zoo-housed chimpanzees it is important to evaluate the effects of zoo visitors on chimpanzee welfare, to develop and study more types of enrichment that are cognitively challenging to chimpanzees, including evaluating positive reinforcement training, and to study the effects of choice and control over the environment on chimpanzee welfare.

**The 2009-2013 AZA Chimpanzee SSP Action Plan identifies the following as potential research topics of importance;

- Developing nutritional guidelines for the aged chimpanzee and special needs chimpanzees, in addition to the general chimpanzee population
- Personality research and investigation into how chimpanzee personality should be incorporated into management decisions, breeding decisions and promoting welfare.
- Use of novel contraception methods (such as gonadotropin releasing hormone agonists) for efficacy, as well as for influence on aggressive and sociosexual behavior.
- Develop information on a descriptive tool for evaluating the progress of introductions.
- Management of large social groups including managing aggression, modeling fission/fusion social organization in captivity, introductions of young, nursery-reared chimpanzees to large social groups, and the effects of reduced reproduction on parental behavior.
- Promoting the psychological well-being of zoo-housed chimpanzees by evaluating the effects of zoo visitors on chimpanzee welfare, studying enrichment that is cognitively challenging, evaluating positive reinforcement training, and studying the effects of choice and control over the environment on chimpanzee well-being
- Geriatric management of chimpanzees
- Keeper emotions and the effects on chimpanzee behavior

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Appendix A: Accreditation Standards by Chapter

The following specific standards of care relevant to chimpanzees are taken from the AZA Accreditation Standards and Related Policies (AZA 2009) and are referenced fully within the chapters of this animal care manual:

General Information

(1.1.1) The institution must comply with all relevant local, state, and federal wildlife laws and regulations. It is understood that, in some cases, AZA accreditation standards are more stringent than existing laws and regulations. In these cases the AZA standard must be met.

Chapter 1

(1.5.7) The animal collection must be protected from weather detrimental to their health.

(10.2.1) Critical life-support systems for the animal collection, including but not limited to plumbing, heating, cooling, aeration, and filtration, must be equipped with a warning mechanism, and emergency backup systems must be available. All mechanical equipment should be under a preventative maintenance program as evidenced through a record-keeping system. Special equipment should be maintained under a maintenance agreement, or a training record should show that staff members are trained for specified maintenance of special equipment.

(1.5.9) The institution must have a regular program of monitoring water quality for collections of fish, pinnipeds, cetaceans, and other aquatic animals. A written record must be maintained to document long-term water quality results and chemical additions.

Chapter 2

(1.5.2) Animals should be displayed, whenever possible, in exhibits replicating their wild habitat and in numbers sufficient to meet their social and behavioral needs. Display of single specimens should be avoided unless biologically correct for the species involved.

(10.3.3) All animal enclosures (exhibits, holding areas, hospital, and quarantine/isolation) must be of a size and complexity sufficient to provide for the animal's physical, social, and psychological well-being; and exhibit enclosures must include provisions for the behavioral enrichment of the animals.

(11.3.3) Special attention must be given to free-ranging animals so that no undue threat is posed to the animal collection, free-ranging animals, or the visiting public. Animals maintained where they will be in contact with the visiting public must be carefully selected, monitored, and treated humanely at all times.

(11.3.1) All animal exhibits and holding areas must be secured to prevent unintentional animal egress.

(11.3.6) Guardrails/barriers must be constructed in all areas where the visiting public could have contact with other than handleable animals.

(11.2.3) All emergency procedures must be written and provided to staff and, where appropriate, to volunteers. Appropriate emergency procedures must be readily available for reference in the event of an actual emergency. These procedures should deal with four basic types of emergencies: fire, weather/environment; injury to staff or a visitor; animal escape.

(11.6.2) Security personnel, whether staff of the institution, or a provided and/or contracted service, must be trained to handle all emergencies in full accordance with the policies and procedures of the institution. In some cases, it is recognized that Security personnel may be in charge of the respective emergency (i.e., shooting teams).

(11.2.4) The institution must have a communication system that can be quickly accessed in case of an emergency.

(11.2.5) A written protocol should be developed involving local police or other emergency agencies and include response times to emergencies.

(11.5.3) Institutions maintaining potentially dangerous animals (sharks, whales, tigers, bears, etc.) must have appropriate safety procedures in place to prevent attacks and injuries by these animals. Appropriate response procedures must also be in place to deal with an attack resulting in an injury. These procedures must be practiced routinely per the emergency drill requirements contained in these standards. Whenever injuries result from these incidents, a written account outlining the cause of the incident, how the injury was handled, and a description of any resulting changes to either the

safety procedures or the physical facility must be prepared and maintained for five years from the date of the incident.

Chapter 3

(1.5.11) Animal transportation must be conducted in a manner that is safe, well-planned and coordinated, and minimizes risk to the animal(s), employees, and general public. All applicable local, state, and federal laws must be adhered to.

Chapter 5

(2.6.2) A formal nutrition program is recommended to meet the behavioral and nutritional needs of all species and specimens within the collection.

(2.6.3) Animal diets must be of a quality and quantity suitable for each animal's nutritional and psychological needs. Diet formulations and records of analysis of appropriate feed items should be maintained and may be examined by the Visiting Committee. Animal food, especially seafood products, should be purchased from reliable sources that are sustainable and/or well managed.

(2.6.1) Animal food preparations must meet all local, state/provincial, and federal regulations.

(2.6.4) The institution should assign at least one person to oversee appropriate browse material for the collection.

Chapter 6

(2.1.1) A full-time staff veterinarian is recommended. However, the Commission realizes that in some cases such is not practical. In those cases, a consulting/part-time veterinarian must be under contract to make at least twice monthly inspections of the animal collection and respond as soon as possible to any emergencies. The Commission also recognizes that certain collections, because of their size and/or nature, may require different considerations in veterinary care.

(2.1.2) So that indications of disease, injury, or stress may be dealt with promptly, veterinary coverage must be available to the animal collection 24 hours a day, 7 days a week.

(2.2.1) Written, formal procedures must be available to the animal care staff for the use of animal drugs for veterinary purposes and appropriate security of the drugs must be provided.

(1.4.6) A staff member must be designated as being responsible for the institution's animal record-keeping system. That person must be charged with establishing and maintaining the institution's animal records, as well as with keeping all animal care staff members apprised of relevant laws and regulations regarding the institution's animal collection.

(1.4.7) Animal records must be kept current, and data must be logged daily.

(1.4.5) At least one set of the institution's historical animal records must be stored and protected. Those records should include permits, titles, declaration forms, and other pertinent information.

(1.4.4) Animal records, whether in electronic or paper form, including health records, must be duplicated and stored in a separate location.

(1.4.3) Animals must be identifiable, whenever practical, and have corresponding ID numbers. For animals maintained in colonies or other animals not considered readily identifiable, the institution must provide a statement explaining how record keeping is maintained.

(1.4.1) An animal inventory must be compiled at least once a year and include data regarding acquisitions and dispositions in the animal collection.

(1.4.2) All species owned by the institution must be listed on the inventory, including those animals on loan to and from the institution. In both cases, notations should be made on the inventory.

(2.7.1) The institution must have holding facilities or procedures for the quarantine of newly arrived animals and isolation facilities or procedures for the treatment of sick/injured animals.

(2.7.3) Quarantine, hospital, and isolation areas should be in compliance with standards or guidelines adopted by the AZA.

(2.7.2) Written, formal procedures for quarantine must be available and familiar to all staff working with quarantined animals.

(11.1.2) Training and procedures must be in place regarding zoonotic diseases.

(11.1.3) A tuberculin testing and surveillance program must be established for appropriate staff in order to ensure the health of both the employees and the animal collection.

(2.5.1) Deceased animals should be necropsied to determine the cause of death. Disposal after necropsy must be done in accordance with local/federal laws.

(2.4.1) The veterinary care program must emphasize disease prevention.

(1.5.5) For animals used in offsite programs and for educational purposes, the institution must have adequate protocols in place to protect the rest of the collection from exposure to infectious agents.
(2.3.1) Capture equipment must be in good working order and available to authorized, trained personnel at all times.
(2.4.2) Keepers should be trained to recognize abnormal behavior and clinical symptoms of illness and have knowledge of the diets, husbandry (including enrichment items and strategies), and restraint procedures required for the animals under their care. However, keepers should not evaluate illnesses nor prescribe treatment.
(2.3.2) Hospital facilities should have x-ray equipment or have access to x-ray services.
(1.5.8) The institution must develop a clear process for identifying and addressing animal welfare concerns within the institution.

Chapter 8

(1.6.1) The institution must have a formal written enrichment program that promotes species-appropriate behavioral opportunities.
(1.6.2) The institution must have a specific staff member(s) or committee assigned for enrichment program oversight, implementation, training, and interdepartmental coordination of enrichment efforts.

Chapter 9

(5.3) A written policy on the use of live animals in programs should be on file. Animals in education programs must be maintained and cared for by trained staff, and housing conditions must meet standards set for the remainder of the animal collection, including species-appropriate shelter, exercise, social and environmental enrichment, access to veterinary care, nutrition, etc. Since some of these requirements can be met outside of the primary enclosure, for example, enclosures may be reduced in size provided that the animal's physical and psychological needs are being met.
(1.5.3) If animal demonstrations are a part of the institution's programs, an education and conservation message must be an integral component.

Chapter 10

(5.3) Institutions should maximize the generation of scientific knowledge gained from the animal collection. This might be achieved by participating in AZA TAG/SSP sponsored research when applicable, conducting original research projects, affiliating with local universities, and/or employing staff with scientific credentials.
(5.2) Institutions must have a written policy that outlines the type of research that it conducts, methods, staff involvement, evaluations, animals to be involved, and guidelines for publication of findings.
(5.1) Research activities must be under the direction of a person qualified to make informed decisions regarding research.

Appendix B: Acquisition/Disposition Policy

I. Introduction: The Association of Zoos and Aquariums (AZA) was established, among other reasons, to foster continued improvement in the zoological park and aquarium profession. One of its most important roles is to provide a forum for debate and consensus building among its members, the intent of which is to attain high ethical standards, especially those related to animal care and professional conduct. The stringent requirements for AZA accreditation and high standards of professional conduct are unmatched by similar organizations and also far surpass the United States Department of Agriculture's Animal and Plant Health Inspection Service's requirements for licensed animal exhibitors. AZA member facilities must abide by a Code of Professional Ethics - a set of standards that guide all aspects of animal management and welfare. As a matter of priority, AZA institutions should acquire animals from other AZA institutions and dispose of animals to other AZA institutions.

AZA-accredited zoological parks and aquariums cannot fulfill their important missions of conservation, education and science without living animals. Responsible management of living animal populations necessitates that some individuals be acquired and that others be removed from the collection at certain times. Acquisition of animals can occur through propagation, trade, donation, loan, purchase, capture, or rescue. Animals used as animal feed are not accessioned into the collection.

Disposition occurs when an animal leaves the collection for any reason. Reasons for disposition vary widely, but include cooperative population management (genetic or demographic management), reintroduction, behavioral incompatibility, sexual maturation, animal health concerns, loan or transfer, or death.

The AZA Acquisition/Disposition Policy (A/D) was created to help (1) guide and support member institutions in their animal acquisition and disposition decisions, and (2) ensure that all additions and removals are compatible with the Association's stated commitment to "save and protect the wonders of the living natural world." More specifically, the AZA A/D Policy is intended to:

- Ensure that the welfare of individual animals and conservation of populations, species and ecosystems are carefully considered during acquisition and disposition activities;
- Maintain a proper standard of conduct for AZA members during acquisition and disposition activities;
- Ensure that animals from AZA member institutions are not transferred to individuals or organizations that lack the appropriate expertise or facilities to care for them.
- Support the goal of AZA's cooperatively managed populations and associated programs, including Species Survival Plans (SSPs), Population Management Plans (PMPs), and Taxon Advisory Groups (TAGs).

The AZA Acquisition/Disposition Policy will serve as the default policy for AZA member institutions. Institutions may develop their own A/D Policy in order to address specific local concerns. Any institutional policy must incorporate and not conflict with the AZA acquisition and disposition standards.

Violations of the AZA Acquisition/Disposition Policy will be dealt with in accordance with the AZA Code of Professional Ethics. Violations can result in an institution's or individual's expulsion from membership in the AZA.

II. Group or Colony-based Identification: For some colonial, group-living, or prolific species, such as certain insects, aquatic invertebrates, schooling fish, rodents, and bats, it is often impossible or highly impractical to identify individual specimens. These species are therefore maintained, acquisitioned, and disposed of as a group or colony. Therefore, when this A/D Policy refers to animals or specimens, it is in reference to both individuals and groups/colonies.

III. Germplasm: Acquisition and disposition of germplasm should follow the same guidelines outlined in this document if its intended use is to create live animal(s). Ownership of germplasm and any resulting animals should be clearly defined. Institutions acquiring or dispositioning germplasm or any animal parts or samples should consider not only its current use, but also future possible uses as new technologies become available.

IV(a). General Acquisitions: Animals are to be acquisitioned into an AZA member institution's collection if the following conditions are met:

1. Acquisitions must meet the requirements of all applicable local, state, federal and international regulations and laws.
2. The Director or Chief Executive Officer of the institution is charged with the final authority and responsibility for the monitoring and implementation of all acquisitions.
3. Acquisitions must be consistent with the mission of the institution, as reflected in its Institutional Collection Plan, by addressing its exhibition/education, conservation, and/or scientific goals.
4. Animals that are acquired for the collection, permanently or temporarily, must be listed on institutional records. All records should follow the Standards for Data Entry and Maintenance of North American Zoo and Aquarium Animal Records Databases®.
5. Animals may be acquired temporarily for reasons such as, holding for governmental agencies, rescue and/or rehabilitation, or special exhibits. Animals should only be accepted if they will not jeopardize the health, care or maintenance of the animals in the permanent collection or the animal being acquired.
6. The institution must have the necessary resources to support and provide for the professional care and management of a species, so that the physical and social needs of both specimen and species are met.
7. Attempts by members to circumvent AZA conservation programs in the acquisition of SSP animals are detrimental to the Association and its conservation programs. Such action may be detrimental to the species involved and is a violation of the Association's Code of Professional Ethics. All AZA members must work through the SSP program in efforts to acquire SSP species and adhere to the AZA Full Participation policy.
8. Animals are only to be acquired from sources that are known to operate legally and conduct their business in a manner that reflects and/or supports the spirit and intent of the AZA Code of Professional Ethics as well as this policy. Any convictions of state, federal, or international wildlife laws should be reviewed, as well as any previous dealings with other AZA-accredited zoos and aquariums.
9. When acquiring specimens managed by a PMP, institutions should consult with the PMP manager.
10. Institutions should consult AZA Wildlife Conservation and Management Committee (WCMC)-approved Regional Collection Plans (RCPs) when making acquisition decisions.

IV(b). Acquisitions from the Wild: The maintenance of wild animal populations for education and wildlife conservation purposes is a unique responsibility of AZA member zoos and aquariums. To accomplish these goals, it may be necessary to acquire wild-caught specimens. Before acquiring animals from the wild, institutions are encouraged to examine sources including other AZA institutions or regional zoological associations.

When acquiring animals from the wild, careful consideration must be taken to evaluate the long-term impacts on the wild population. Any capture of free-ranging animals should be done in accordance with all local, state, federal, and international wildlife laws and regulations and not be detrimental to the long-term viability of the species or the wild or managed population(s). In crisis situations, when the survival of a population is at risk, rescue decisions are to be made on a case-by-case basis.

V(a). Disposition Requirements – living animals: Successful conservation and animal management efforts rely on the cooperation of many entities, both within and outside of AZA. While preference is given to placing animals within AZA member institutions, it is important to foster a cooperative culture among those who share the primary mission of AZA-accredited facilities. The AZA draws a strong distinction between the mission, stated or otherwise, of non-AZA member organizations and the mission of professionally managed zoological parks and aquariums accredited by the AZA.

An accredited AZA member balances public display, recreation, and entertainment with demonstrated efforts in education, conservation, and science. While some non-AZA member organizations may meet minimum daily standards of animal care for wildlife, the AZA recognizes that this, by itself, is insufficient to warrant either AZA membership or participation in AZA's cooperative animal management programs. When an animal is sent to a non-member of AZA, it is imperative that the member be confident that the animal will be cared for properly.

Animals may only be disposed of from an AZA member institution's collection if the following conditions are met:

1. Dispositions must meet the requirements of all applicable local, state, federal and international regulations and laws.
2. The Director or Chief Executive Officer of the institution is charged with the final authority and responsibility for the monitoring and implementation of all dispositions.
3. Any disposition must abide by the Mandatory Standards and General Advisories of the AZA Code of Professional Ethics. Specifically, "a member shall make every effort to assure that all animals in his/her collection and under his/her care are disposed of in a manner which meets the current disposition standards of the Association and do not find their way into the hands of those not qualified to care for them properly."
4. Non-domesticated animals shall not be disposed of at animal auctions. Additionally, animals shall not be disposed of to any organization or individual that may use or sell the animal at an animal auction. In transactions with AZA non-members, the recipient must ensure in writing that neither the animal nor its offspring will be disposed of at a wild animal auction or to an individual or organization that allows the hunting of the animal.
5. Animals shall not be disposed of to organizations or individuals that allow the hunting of these animals or their offspring. This does not apply to individuals or organizations which allow the hunting of only free-ranging game species (indigenous to North America) and established long-introduced species such as, but not limited to, white-tailed deer, quail, rabbit, waterfowl, boar, ring-necked pheasant, chukar, partridge, and trout. AZA distinguishes hunting/fishing for sport from culling for sustainable population management and wildlife conservation purposes.
6. Attempts by members to circumvent AZA conservation programs in the disposition of SSP animals are detrimental to the Association and its conservation programs. Such action may be detrimental to the species involved and is a violation of the Association's Code of Professional Ethics. All AZA members must work through the SSP program in efforts to deacquisition SSP species and adhere to the AZA Full Participation policy.
7. Domesticated animals are to be disposed of in a manner consistent with acceptable farm practices and subject to all relevant laws and regulations.
8. Live specimens may be released within native ranges, subject to all relevant laws and regulations. Releases may be a part of a recovery program and any release must be compatible with the AZA Guidelines for Reintroduction of Animals Born or Held in Captivity, dated June 3, 1992.
9. Detailed disposition records of all living or dead specimens must be maintained. Where applicable, proper animal identification techniques should be utilized.
10. It is the obligation of every loaning institution to monitor, at least annually, the conditions of any loaned specimens and the ability of the recipient to provide proper care. If the conditions and care of animals are in violation of the loan agreement, it is the obligation of the loaning institution to recall the animal. Furthermore, an institution's loaning policy must not be in conflict with this A/D Policy.
11. If live specimens are euthanized, it must be done in accordance with the established policy of the institution and the Report of the American Veterinary Medical Association Panel on Euthanasia (Journal of the American Veterinary Medical Association 218 (5): 669-696, 2001).
12. In dispositions to non-AZA members, the non-AZA member's mission (stated or implied) must not be in conflict with the mission of AZA, or with this A/D Policy.
13. In dispositions to non-AZA member facilities that are open to the public, the non-AZA member must balance public display, recreation, and entertainment with demonstrated efforts in conservation, education, and science.
14. In dispositions to non-AZA members, the AZA members must be convinced that the recipient has the expertise, records management practices, financial stability, facilities, and resources required to properly care for and maintain the animals and their offspring. It is recommended that this documentation be kept in the permanent record of the animals at the AZA member institution.
15. If living animals are sent to a non-AZA member research institution, the institution must be registered under the Animal Welfare Act by the U.S. Department of Agriculture Animal and Plant Health Inspection Service. For international transactions, the receiving facility should be registered by that country's equivalent body with enforcement over animal welfare.
16. No animal disposition should occur if it would create a health or safety risk (to the animal or humans) or have a negative impact on the conservation of the species.

17. Inherently dangerous wild animals or invasive species should not be dispositioned to the pet trade or those unqualified to care for them.
18. Under no circumstances should any primates be dispositioned to a private individual or to the pet trade.
19. Fish and aquatic invertebrate species that meet ANY of the following are inappropriate to be disposed of to private individuals or the pet trade:
    a. species that grow too large to be housed in a 72-inch long, 180 gallon aquarium (the largest tank commonly sold in retail stores)
    b. species that require extraordinary life support equipment to maintain an appropriate *ex situ* environment (e.g., cold water fish and invertebrates)
    c. species deemed invasive (e.g., snakeheads)
    d. species capable of inflicting a serious bite or venomous sting (e.g., piranha, lion fish, blue-ringed octopus)
    e. species of wildlife conservation concern
20. When dispositioning specimens managed by a PMP, institutions should consult with the PMP manager.
21. Institutions should consult WCMC-approved RCPs when making disposition decisions.

V(b). Disposition Requirements – dead specimens: Dead specimens (including animal parts and samples) are only to be disposed of from an AZA member institution's collection if the following conditions are met:

1. Dispositions of dead specimens must meet the requirements of all applicable local, state, federal and international regulations and laws.
2. Maximum utilization is to be made of the remains, which could include use in educational programs or exhibits.
3. Consideration is given to scientific projects that provide data for species management and/or conservation.
4. Records (including ownership information) are to be kept on all dispositions, including animal body parts, when possible.
5. SSP and TAG necropsy protocols are to be accommodated insofar as possible.

VI. Transaction Forms: AZA member institutions will develop transaction forms to record animal acquisitions and dispositions. These forms will require the potential recipient or provider to adhere to the AZA Code of Professional Ethics, the AZA Acquisition/Disposition Policy, and all relevant AZA and member policies, procedures and guidelines. In addition, transaction forms must insist on compliance with the applicable laws and regulations of local, state, federal and international authorities.

Appendix C: Recommended Quarantine Procedures

Quarantine facility: A separate quarantine facility, with the ability to accommodate mammals, birds, reptiles, amphibians, and fish should exist. If a specific quarantine facility is not present, then newly acquired animals should be isolated from the established collection in such a manner as to prohibit physical contact, to prevent disease transmission, and to avoid aerosol and drainage contamination.

Such separation should be obligatory for primates, small mammals, birds, and reptiles, and attempted wherever possible with larger mammals such as large ungulates and carnivores, marine mammals, and cetaceans. If the receiving institution lacks appropriate facilities for isolation of large primates, pre-shipment quarantine at an AZA or AALAS accredited institution may be applied to the receiving institutions protocol. In such a case, shipment must take place in isolation from other primates. More stringent local, state, or federal regulations take precedence over these recommendations.

Quarantine length: Quarantine for all species should be under the supervision of a veterinarian and consist of a minimum of 30 days (unless otherwise directed by the staff veterinarian). Mammals: If during the 30-day quarantine period, additional mammals of the same order are introduced into a designated quarantine area, the 30-day period must begin over again. However, the addition of mammals of a different order to those already in quarantine will not have an adverse impact on the originally quarantined mammals. Birds, Reptiles, Amphibians, or Fish: The 30-day quarantine period must be closed for each of the above Classes. Therefore, the addition of any new birds into a bird quarantine area requires that the 30-day quarantine period begin again on the date of the addition of the new birds. The same applies for reptiles, amphibians, or fish.

Quarantine personnel: A keeper should be designated to care only for quarantined animals or a keeper should attend quarantined animals only after fulfilling responsibilities for resident species. Equipment used to feed and clean animals in quarantine should be used only with these animals. If this is not possible, then equipment must be cleaned with an appropriate disinfectant (as designated by the veterinarian supervising quarantine) before use with post-quarantine animals.

Institutions must take precautions to minimize the risk of exposure of animal care personnel to zoonotic diseases that may be present in newly acquired animals. These precautions should include the use of disinfectant foot baths, wearing of appropriate protective clothing and masks in some cases, and minimizing physical exposure in some species; e.g., primates, by the use of chemical rather than physical restraint. A tuberculin testing/surveillance program must be established for zoo/aquarium employees in order to ensure the health of both the employees and the animal collection.

Quarantine protocol: During this period, certain prophylactic measures should be instituted. Individual fecal samples or representative samples from large numbers of individuals housed in a limited area (e.g., birds of the same species in an aviary or frogs in a terrarium) should be collected at least twice and examined for gastrointestinal parasites. Treatment should be prescribed by the attending veterinarian. Ideally, release from quarantine should be dependent on obtaining two negative fecal results spaced a minimum of two weeks apart either initially or after parasiticide treatment. In addition, all animals should be evaluated for ectoparasites and treated accordingly.

Vaccinations should be updated as appropriate for each species. If the animal arrives without a vaccination history, it should be treated as an immunologically naive animal and given an appropriate series of vaccinations. Whenever possible, blood should be collected and sera banked. Either a 70ºC (-94°F) - frost-free freezer or a 20ºC (-4°F) -freezer that is not frost-free should be available to save sera. Such sera could provide an important resource for retrospective disease evaluation.

The quarantine period also represents an opportunity to, where possible, permanently identify all unmarked animals when anesthetized or restrained (e.g., tattoo, ear notch, ear tag, etc.). Also, whenever animals are restrained or immobilized, a complete physical, including a dental examination, should be performed. Complete medical records should be maintained and available for all animals during the quarantine period. Animals that die during quarantine should have a necropsy performed under the supervision of a veterinarian and representative tissues submitted for histopathologic examination.

Quarantine procedures: The following are recommendations and suggestions for appropriate quarantine procedures for chimpanzees:

Required:

1. Direct and floatation fecals as described above
2. A minimum of 2 negative tuberculin tests using a tuberculin containing at least 1,500 units/0.1ml (e.g., Mammalian Human Isolate, Coopers Animal Health) or other appropriate regimen as necessary for the species in question
3. CBC/sera chemistry panel
4. Culture of feces for *Salmonella*/*Shigella*/*Campylobacter*
5. For appropriate species (e.g., Old World monkeys) serology for *Herpesvirus simiae* (Herpes B)

Strongly Recommended:

1. Chest radiographs
2. Appropriate viral panels (SIV, retrovirus type D)
3. Urinalysis

Appendix D: Program Animal Policy and Position Statement

Program Animal Policy

Originally approved by the AZA Board of Directors – 2003

Updated and approved by the Board – July 2008 & June 2011

The Association of Zoos & Aquariums (AZA) recognizes many benefits for public education and, ultimately, for conservation in program animal presentations. AZA's Conservation Education Committee's *Program Animal Position Statement* summarizes the value of program animal presentations (see pages 42-44).

For the purpose of this policy, a Program Animal is defined as "an animal whose role includes handling and/or training by staff or volunteers for interaction with the public and in support of institutional education and conservation goals". Some animals are designated as Program Animals on a full-time basis, while others are designated as such only occasionally. Program Animal-related Accreditation Standards are applicable to all animals during the times that they are designated as Program Animals.

There are three main categories of Program Animal interactions:

1. On Grounds with the Program Animal Inside the Exhibit/Enclosure:
    i. Public access outside the exhibit/enclosure. Public may interact with animals from outside the exhibit/enclosure (e.g., giraffe feeding, touch tanks).
    ii. Public access inside the exhibit/enclosure. Public may interact with animals from inside the exhibit/enclosure (e.g., lorikeet feedings, 'swim with' programs, camel/pony rides).
2. On Grounds with the Program Animal Outside the Exhibit/Enclosure:
    i. Minimal handling and training techniques are used to present Program Animals to the public. Public has minimal or no opportunity to directly interact with Program Animals when they are outside the exhibit/enclosure (e.g., raptors on the glove, reptiles held "presentation style").
    ii. Moderate handling and training techniques are used to present Program Animals to the public. Public may be in close proximity to, or have direct contact with, Program Animals when they're outside the exhibit/enclosure (e.g., media, fund raising, photo, and/or touch opportunities).
    iii. Significant handling and training techniques are used to present Program Animals to the public. Public may have direct contact with Program Animals or simply observe the in-depth presentations when they're outside the exhibit/enclosure (e.g., wildlife education shows).
3. Off Grounds:
    i. Handling and training techniques are used to present Program Animals to the public outside of the zoo/aquarium grounds. Public may have minimal contact or be in close proximity to and have direct contact with Program Animals (e.g., animals transported to schools, media, fund raising events).

These categories assist staff and accreditation inspectors in determining when animals are designated as Program Animals and the periods during which the Program Animal-related Accreditation Standards are applicable. In addition, these Program Animal categories establish a framework for understanding increasing degrees of an animal's involvement in Program Animal activities.

Program animal presentations bring a host of responsibilities, including the safety and welfare of the animals involved, the safety of the animal handler and public, and accountability for the take-home, educational messages received by the audience. Therefore, AZA requires all accredited institutions that make program animal presentations to develop an institutional program animal policy that clearly identifies and justifies those species and individuals approved as program animals and details their long-term management plan and educational program objectives.

AZA's accreditation standards require that education and conservation messages must be an integral component of all program animal presentations. In addition, the accreditation standards require that the conditions and treatment of animals in education programs must meet standards set for the remainder of the animal collection, including species-appropriate shelter, exercise, appropriate environmental enrichment, access to veterinary care, nutrition, and other related standards. In addition, providing program animals with options to choose among a variety of conditions within their environment is

essential to ensuring effective care, welfare, and management. Some of these requirements can be met outside of the primary exhibit enclosure while the animal is involved in a program or is being transported. For example, free-flight birds may receive appropriate exercise during regular programs, reducing the need for additional exercise. However, the institution must ensure that in such cases, the animals participate in programs on a basis sufficient to meet these needs or provide for their needs in their home enclosures; upon return to the facility the animal should be returned to its species-appropriate housing as described above.

Program Animal Position Statement

Last revision 1/28/03
Re-authorized by the Board June 2011

The Conservation Education Committee (CEC) of the Association of Zoos and Aquariums supports the appropriate use of program animals as an important and powerful educational tool that provides a variety of benefits to zoo and aquarium educators seeking to convey cognitive and affective (emotional) messages about conservation, wildlife and animal welfare.

Utilizing these animals allows educators to strongly engage audiences. As discussed below, the use of program animals has been demonstrated to result in lengthened learning periods, increased knowledge acquisition and retention, enhanced environmental attitudes, and the creation of positive perceptions concerning zoo and aquarium animals.

Audience Engagement

Zoos and aquariums are ideal venues for developing emotional ties to wildlife and fostering an appreciation for the natural world. However, developing and delivering effective educational messages in the free-choice learning environments of zoos and aquariums is a difficult task.

Zoo and aquarium educators are constantly challenged to develop methods for engaging and teaching visitors who often view a trip to the zoo as a social or recreational experience (Morgan and Hodgkinson, 1999). The use of program animals can provide the compelling experience necessary to attract and maintain personal connections with visitors of all motivations, thus preparing them for learning and reflection on their own relationships with nature.

Program animals are powerful catalysts for learning for a variety of reasons. They are generally active, easily viewed, and usually presented in close proximity to the public. These factors have proven to contribute to increasing the length of time that people spend watching animals in zoo exhibits (Bitgood, Patterson and Benefield, 1986, 1988; Wolf and Tymitz, 1981).

In addition, the provocative nature of a handled animal likely plays an important role in captivating a visitor. In two studies (Povey, 2002; Povey and Rios, 2001), visitors viewed animals three and four times longer while they were being presented in demonstrations outside of their enclosure with an educator than while they were on exhibit. Clearly, the use of program animals in shows or informal presentations can be effective in lengthening the potential time period for learning and overall impact.

Program animals also provide the opportunity to personalize the learning experience, tailoring the teaching session to what interests the visitors. Traditional graphics offer little opportunity for this level of personalization of information delivery and are frequently not read by visitors (Churchman, 1985; Johnston, 1998). For example, Povey (2001) found that only 25% of visitors to an animal exhibit read the accompanying graphic; whereas, 45% of visitors watching the same animal handled in an educational presentation asked at least one question and some asked as many as seven questions. Having an animal accompany the educator allowed the visitors to make specific inquiries about topics in which they were interested.

Knowledge Acquisition

Improving our visitors' knowledge and understanding regarding wildlife and wildlife conservation is a fundamental goal for many zoo educators using program animals. A growing body of evidence supports the validity of using program animals to enhance delivery of these cognitive messages as well.

- MacMillen (1994) found that the use of live animals in a zoomobile outreach program significantly enhanced cognitive learning in a vertebrate classification unit for sixth grade students.
- Sherwood and his colleagues (1989) compared the use of live horseshoe crabs and sea stars to the use of dried specimens in an aquarium education program and demonstrated that students made the greatest cognitive gains when exposed to programs utilizing the live animals.
- Povey and Rios (2002) noted that in response to an open-ended survey question ("Before I saw this animal, I never realized that . . . "), visitors watching a presentation utilizing a program animal provided 69% cognitive responses (i.e., something they learned) versus 9% made by visitors viewing the same animal in its exhibit (who primarily responded with observations).
- Povey (2002) recorded a marked difference in learning between visitors observing animals on exhibit versus being handled during informal presentations. Visitors to demonstrations utilizing a raven and radiated tortoises were able to answer questions correctly at a rate as much as eleven times higher than visitors to the exhibits.

Enhanced Environmental Attitudes

Program animals have been clearly demonstrated to increase affective learning and attitudinal change.

- Studies by Yerke and Burns (1991) and Davison and her colleagues (1993) evaluated the effect live animal shows had on visitor attitudes. Both found their shows successfully influenced attitudes about conservation and stewardship.
- Yerke and Burns (1993) also evaluated a live bird outreach program presented to Oregon fifth-graders and recorded a significant increase in students' environmental attitudes after the presentations.
- Sherwood and his colleagues (1989) found that students who handled live invertebrates in an education program demonstrated both short and long-term attitudinal changes as compared to those who only had exposure to dried specimens.
- Povey and Rios (2002) examined the role program animals play in helping visitors develop positive feelings about the care and well-being of zoo animals.
- As observed by Wolf and Tymitz (1981), zoo visitors are deeply concerned with the welfare of zoo animals and desire evidence that they receive personalized care.

Conclusion

Creating positive impressions of aquarium and zoo animals, and wildlife in general, is crucial to the fundamental mission of zoological institutions. Although additional research will help us delve further into this area, the existing research supports the conclusion that program animals are an important tool for conveying both cognitive and affective messages regarding animals and the need to conserve wildlife and wild places.

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Appendix E: Developing an Institutional Program Animal Policy

Last revision 2003
Re-authorized by the Board June 2011

Rationale

Membership in AZA requires that an institution meet the AZA Accreditation Standards collectively developed by our professional colleagues. Standards guide all aspects of an institution's operations; however, the accreditation commission has asserted that ensuring that member institutions demonstrate the highest standards of animal care is a top priority. Another fundamental AZA criterion for membership is that education be affirmed as core to an institution's mission. All accredited public institutions are expected to develop a written education plan and to regularly evaluate program effectiveness.

The inclusion of animals (native, exotic and domestic) in educational presentations, when done correctly, is a powerful tool. CEC's **Program Animal Position Statement** describes the research underpinning the appropriate use of program animals as an important and powerful educational tool that provides a variety of benefits to zoo and aquarium educators seeking to convey cognitive and affective messages about conservation and wildlife.

Ongoing research, such as AZA's Multi-Institutional Research Project (MIRP) and research conducted by individual AZA institutions will help zoo educators to determine whether the use of program animals conveys intended and/or conflicting messages and to modify and improve programs accordingly and to ensure that all program animals have the best possible welfare.

When utilizing program animals our responsibility is to meet both our high standards of animal care and our educational goals. Additionally, as animal management professionals, we must critically address both the species' conservation needs and the welfare of the individual animal. Because "wild creatures differ endlessly," in their forms, needs, behavior, limitations and abilities (Conway, 1995), AZA, through its Animal Welfare Committee, has recently given the responsibility to develop taxon- and species-specific animal welfare standards and guidelines to the Taxon Advisory Groups (TAG) and Species Survival Plan® Program (SSP). Experts within each TAG or SSP, along with their education advisors, are charged with assessing all aspects of the taxons' and/or species' biological and social needs and developing Animal Care Manuals (ACMs) that include specifications concerning their use as program animals.
However, even the most exacting standards cannot address the individual choices faced by each AZA institution. Therefore, each institution is required to develop a program animal policy that articulates and evaluates program benefits. The following recommendations are offered to assist each institution in formulating its own Institutional Program Animal Policy, which incorporates the AZA Program Animal Policy and addresses the following matters.

The Policy Development Process

Within each institution, key stakeholders should be included in the development of that institution's policy, including, but not limited to representatives from:

- the Education Department
- the Animal Husbandry Department
- the Veterinary and Animal Health Department
- the Conservation & Science Department
- the Behavioral Husbandry Department
- any animal show staff (if in a separate department)
- departments that frequently request special program animal situations (e.g., special events, development, marketing, zoo or aquarium society, administration)

Additionally, staff from all levels of the organization should be involved in this development (e.g., curators, keepers, education managers, interpreters, volunteer coordinators).

To develop a comprehensive Program Animal Policy, we recommend that the following components be included:

I. Philosophy

In general, the position of the AZA is that the use of animals in up close and personal settings, including animal contact, can be extremely positive and powerful, as long as:

1. The use and setting is appropriate.
2. Animal and human welfare is considered at all times.
3. The animal is used in a respectful, safe manner and in a manner that does not misrepresent or degrade the animal.
4. A meaningful conservation message is an integral component. Read the AZA Board-approved Conservation Messages.
5. Suitable species and individual specimens are used.

Institutional program animal policies should include a philosophical statement addressing the above, and should relate the use of program animals to the institution's overall mission statement.

II. Appropriate Settings

The Program Animal Policy should include a listing of all settings both on and off site, where program animal use is permitted. This will clearly vary among institutions. Each institution's policy should include a comprehensive list of settings specific to that institution. Some institutions may have separate policies for each setting; others may address the various settings within the same policy. Examples of settings include:

I. On-site programming
   A. Informal and non-registrants:
      1. On-grounds programming with animals being brought out (demonstrations, lectures, parties, special events, and media)
      2. Children's zoos and contact yards
      3. Behind-the-scenes open houses
      4. Shows
      5. Touch pools
   B. Formal (registration involved) and controlled settings
      1. School group programs
      2. Summer Camps
      3. Overnights
      4. Birthday Parties
      5. Animal rides
      6. Public animal feeding programs

II. Offsite and Outreach
      1. PR events (TV, radio)
      2. Fundraising events
      3. Field programs involving the public
      4. School visits
      5. Library visits
      6. Nursing Home visits (therapy)
      7. Hospital visits
      8. Senior Centers
      9. Civic Group events

In some cases, policies will differ from setting to setting (e.g., on-site and off-site use with media). These settings should be addressed separately, and should reflect specific animal health issues, assessment of distress in these situations, limitations, and restrictions.

III. Compliance with Regulations

All AZA institutions housing mammals are regulated by the USDA's Animal Welfare Act. Other federal regulations, such as the Marine Mammal Protection Act, may apply. Additionally, many states, and some cities, have regulations that apply to animal contact situations. Similarly, all accredited institutions are bound by the AZA Code of Professional Ethics. It is expected that the Institution Program Animal Policy address compliance with appropriate regulations and AZA Accreditation Standards.

IV. Collection Planning

All AZA accredited institutions should have a collection planning process in place. Program animals are part of an institution's overall collection and must be included in the overall collection planning process. The AZA Guide to Accreditation contains specific requirements for the institution collection plan. For more information about collection planning in general, please see the Collection Management pages in the Members Only section.

The following recommendations apply to program animals:

1. Listing of approved program animals (to be periodically amended as collection changes). Justification of each species should be based upon criteria such as:
    - Temperament and suitability for program use
    - Husbandry requirements
    - Husbandry expertise
    - Veterinary issues and concerns
    - Ease and means of acquisition / disposition according to the AZA code of ethics
    - Educational value and intended conservation message
    - Conservation Status
    - Compliance with TAG and SSP guidelines and policies
2. General guidelines as to how each species (and, where necessary, for each individual) will be presented to the public, and in what settings
3. The collection planning section should reference the institution's acquisition and disposition policies.

V. Conservation Education Message

As noted in the AZA Accreditation Standards, if animal demonstrations are part of an institution's programs, an educational and conservation message must be an integral component. The Program Animal Policy should address the specific messages related to the use of program animals, as well as the need to be cautious about hidden or conflicting messages (e.g., "petting" an animal while stating verbally that it makes a poor pet). This section may include or reference the AZA Conservation Messages.

Although education value and messages should be part of the general collection planning process, this aspect is so critical to the use of program animals that it deserves additional attention. In addition, it is highly recommended to encourage the use of biofacts in addition to or in place of the live animals. Whenever possible, evaluation of the effectiveness of presenting program animals should be built into education programs.

VI. Human Health and Safety

The safety of our staff and the public is one of the greatest concerns in working with program animals. Although extremely valuable as educational and affective experiences, contact with animals poses certain risks to the handler and the public. Therefore, the human health and safety section of the policy should address:

1. Minimization of the possibility of disease transfer from non-human animals to humans, and vice-versa (e.g., handwashing stations, no touch policies, use of hand sanitizer)
2. Safety issues related to handlers' personal attire and behavior (e.g., discourage or prohibit use of long earrings, perfume and cologne, not eating or drinking around animals, smoking etc.)

AZA's Animal Contact Policy provides guidelines in this area; these guidelines were incorporated into accreditation standards in 1998.

VII. Animal Health and Welfare

Animal health and welfare are the highest priority of AZA accredited institutions. As a result, the Institutional Program Animal Policy should make a strong statement on the importance of animal welfare. The policy should address:

1. General housing, husbandry, and animal health concerns (e.g. that the housing and husbandry for program animals meets or exceeds general AZA standards and that the physical, social and psychological needs of the individual animal, such as adequate rest periods, provision of enrichment, visual cover, contact with conspecifics as appropriate, etc., are accommodated).
2. Where ever possible provide a choice for animal program participation, e.g., retreat areas for touch tanks or contact yards, evaluation of willingness/readiness to participate by handler, etc.)
3. The empowerment of handlers to make decisions related to animal health and welfare; such as withdrawing animals from a situation if safety or health is in danger of being compromised.
4. Requirements for supervision of contact areas and touch tanks by trained staff and volunteers.
5. Frequent evaluation of human / animal interactions to assess safety, health, welfare, etc.
6. Ensure that the level of health care for the program animals is consistent with that of other animals in the collection.
7. Whenever possible have a “cradle to grave” plan for each program animal to ensure that the animal can be taken care of properly when not used as a program animal anymore.
8. If lengthy “down” times in program animal use occur, staff should ensure that animals accustomed to regular human interactions can still maintain such contact and receive the same level of care when not used in programs.

VIII. Taxon Specific Protocols

We encourage institutions to provide taxonomically specific protocols, either at the genus or species level, or the specimen, or individual, level. Some taxon-specific guidelines may affect the use of program animals. To develop these, institutions refer to the Conservation Programs Database.

Taxon and species -specific protocols should address:

1. How to remove the individual animal from and return it to its permanent enclosure, including suggestions for operant conditioning training.
2. How to crate and transport animals.
3. Signs of stress, stress factors, distress and discomfort behaviors.

Situation specific handling protocols (e.g., whether or not animal is allowed to be touched by the public, and how to handle in such situations)

1. Guidelines for disinfecting surfaces, transport carriers, enclosures, etc. using environmentally safe chemicals and cleaners where possible.
2. Animal facts and conservation information.
3. Limitations and restrictions regarding ambient temperatures and or weather conditions.
4. Time limitations (including animal rotation and rest periods, as appropriate, duration of time each animal can participate, and restrictions on travel distances).
5. The numbers of trained personnel required to ensure the health and welfare of the animals, handlers and public.
6. The level of training and experience required for handling this species
7. Taxon/species-specific guidelines on animal health.
8. The use of hand lotions by program participants that might touch the animals

IX. Logistics: Managing the Program

The Institutional Policy should address a number of logistical issues related to program animals, including:

1. Where and how the program animal collection will be housed, including any quarantine and separation for animals used off-site.
2. Procedures for requesting animals, including the approval process and decision making process.
3. Accurate documentation and availability of records, including procedures for documenting animal usage, animal behavior, and any other concerns that arise.

X. Staff Training

Thorough training for all handling staff (keepers, educators, and volunteers, and docents) is clearly critical. Staff training is such a large issue that many institutions may have separate training protocols and procedures. Specific training protocols can be included in the Institutional Program Animal Policy or reference can be made that a separate training protocol exists.

It is recommended that the training section of the policy address:

1. Personnel authorized to handle and present animals.
2. Handling protocol during quarantine.
3. The process for training, qualifying and assessing handlers including who is authorized to train handlers.
4. The frequency of required re-training sessions for handlers.
5. Personnel authorized to train animals and training protocols.
6. The process for addressing substandard performance and noncompliance with established procedures.
7. Medical testing and vaccinations required for handlers (e.g., TB testing, tetanus shots, rabies vaccinations, routine fecal cultures, physical exams, etc.).
8. Training content (e.g., taxonomically specific protocols, natural history, relevant conservation education messages, presentation techniques, interpretive techniques, etc.).
9. Protocols to reduce disease transmission (e.g., zoonotic disease transmission, proper hygiene and hand washing requirements, as noted in AZA's Animal Contact Policy).
10. Procedures for reporting injuries to the animals, handling personnel or public.
11. Visitor management (e.g., ensuring visitors interact appropriately with animals, do not eat or drink around the animal, etc.).

XI. Review of Institutional Policies

All policies should be reviewed regularly. Accountability and ramifications of policy violations should be addressed as well (e.g., retraining, revocation of handling privileges, etc.). Institutional policies should address how frequently the Program Animal Policy will be reviewed and revised, and how accountability will be maintained.

XII. TAG and SSP Recommendations

Following development of taxon-specific recommendations from each TAG and SSP, the institution policy should include a statement regarding compliance with these recommendations. If the institution chooses not to follow these specific recommendations, a brief statement providing rationale is recommended.

Appendix F. AZA Chimpanzee SSP Steering Committee and Advisors

(Current as of 12/31/09)

Name	Position	Institution
Steve Ross	Chair	Lincoln Park Zoo
Lisa New	Vice Chair	Knoxville Zoo
Rebecca Gullott	Secretary	Maryland Zoo
Leslie Field		Sacramento Zoo
Jennifer Ireland		North Carolina Zoo
Liz Harmon		Kansas City Zoo
Jennie McNary		Los Angeles Zoo
Terry Wolf		Lion Country Safari
Ingrid Porton		Saint Louis Zoo
Lee Ann Rottman		Lowry Park Zoo
Syd Tanner		Little Rock Zoo
Jennifer Davis		Oklahoma City Zoo
Hollie Colahan		Houston Zoo
Kay Backues	Veterinary Co-advisor	Tulsa Zoo
Tammie Bettinger	Sanctuary Advisor	Disney's Animal Kingdom
Mollie Bloomsmith	Research Advisor	Yerkes Primate Research Center
Todd Bowsher	Contraception Advisor	Dallas Zoo
Kathryn Gamble	Veterinary Co-advisor	Lincoln Park Zoo
Elizabeth Lonsdorf	*In situ* advisor	Lincoln Park Zoo
Terri Hunnicutt	Husbandry Advisor	Saint Louis Zoo
Lorraine Smith	Legislative Advisor	

Appendix G. Necropsy Protocol for Great Apes

Adapted from the American Association of Zoo Veterinarians (AAZV) 'Standardized Necropsy Report for Great Apes and Other Primates'. Contact AAZV (www.aazv.org) for unedited standardized necropsy report. Original, unedited necropsy form available from the American Association of Zoo Veterinarians (AAZV, 581705 White Oak Road, Yulee, FL 32097; Telephone: 904-225-3275).

STANDARDIZED NECROPSY REPORT FOR GREAT APES AND OTHER PRIMATES

WORK SHEET
Pathology # _____Species_____ Date_____
Animal #/Name _____ Sex _____ Age(DOB)_____
Date of Death/Euthanasia _____ Time _____ (am/pm)
Method of euthanasia _____
Time and date of necropsy _____ Duration of necropsy _____
Post mortem state _____ Nutritional state _____
Pathologist or prosector and institution:_____
_____
Gross diagnoses:

_____
Abstract of clinical history:

_____
Please check tissues submitted for histopathology.
External Examination (note evidence of trauma, exudates, diarrhea etc):
_____Hair coat:
_____Skin:
_____Scent glands:
_____Mammary glands and nipples:
_____Umbilicus (see neonatal/fetal protocol):
_____Subcutis (note: fat, edema, hemorrhage, parasites):
_____Mucous membranes (note: color, exudates):
Ocular or nasal exudate?:
_____Eyes and ears:
____ External genitalia:
_____Oral cavity, cheek pouches and pharynx:
Dentition:
_____Tongue:

Musculoskeletal System:
Note fractures, dislocations, malformations?:
____ Bone growth plate (rib, distal femur, sternabra)
_____Muscles:
_____Bone marrow (femur):
_____Joints (note any exudates or arthritis):
_____Spinal column (examine ventral aspect when viscera removed)

Examination of the neck region
_____Larynx:
_____Laryngeal air sac (see protocol for great apes):
_____Mandibular and parotid salivary glands:
_____Thyroids and parathyroids:
_____Cervical/cranial lymph nodes:
_____Esophagus:

Thoracic Cavity:
Note any effusions, adhesions, or hemorrhage:
Note amount, color and any lesions in mediastinal and coronary fat:
_____Thymus
_____Heart (see attached protocol):
_____Great vessels:
_____Trachea and bronchi
_____Lungs:
_____Esophagus:
_____Lymph nodes:

Abdominal Cavity:
Note any effusions, adhesions, or hemorrhage:
Note amount, color or lesions in omental, mesenteric and perirenal fat:

_____Liver and gall bladder:
_____Stomach:
_____Pancreas:
_____Duodenum:
_____Jejunum:
_____Ileum:
_____Cecum and (in apes) appendix:
_____Colon and rectum:
_____Lymph nodes:
_____Kidneys and ureters:
_____Adrenals:
_____Gonads:
_____Uterus:
_____Bladder and urethra:
_____Male accessory sex glands (prostate and seminal vesicles):
_____Umbilical vessels, round ligaments of bladder in neonates:
_____Abdominal aorta and caudal vena cava:

Nervous System:
_____Meninges:
_____Brain:
_____Pituitary:
_____Trigeminal (gasserian) ganglia:
_____Spinal cord (please note to which lumbar segment the cord extends):
_____Brachial plexus and sciatic nerves:
Is there an identifiable pineal gland?

WEIGHTS AND MEASUREMENTS (if at all possible, in grams, kilograms and cm, please):

Body weight:_____
Lymphoid tissue:
R. axillary LN _____ L. axillary LN _____
R. inguinal LN _____ L. inguinal LN _____
Jejunal LN _____
Spleen _____ Thymus _____

Abdominal Organs:
Liver _____
R. kidney _____ L. kidney _____
R. adrenal _____ L. adrenal _____
R. ovary _____ L. ovary _____
uterus _____
placenta (weigh and measure disc(s)):

Thoracic Organs:

Heart wt._____ Thymus (above)
Height:_____ Circumference at coronary groove:_____
Left Vent.thickness_____ Rt. vent.thickness_____
Septum_____
Lt. AV valve circ._____ Rt. AV valve circ._____
Aortic valve circ._____ Pulmonary v. circ._____
R. lung _____ L. lung _____

Other:

Brain _____ Tumors? _____
R. testes (wt.)_____ L. Testes _____
Length x dia._____ _____
Penis (length x diameter) _____

STANDARDIZED BODY MEASUREMENTS FOR NONHUMAN PRIMATES INCLUDING APES:

crown rump length (linear)_____
crown rump length (curvalinear)_____
cranial circumference (above brow ridge)_____
Length of head (tip of jaw to top of crest)_____
width of brow ridge_____
chest circumference (at nipples)_____
abdominal circumference (at umbilicus)_____
Left arm: Shoulder-elbow:_____
elbow-wrist:_____
wrist-tip of middle finger:_____
pollex:_____
Right arm: Shoulder elbow:_____
elbow- wrist:_____
wrist-tip of middle finger:_____
pollex:_____
Left leg: hip-knee:_____
knee-ankle:_____
ankle-tip of big toe:_____
heel-tip of big toe:_____
hallux:_____
Right leg: hip-knee:_____
knee-ankle:_____
ankle-tip of big toe:_____
heel-tip of big toe:_____
hallux:_____

ANCILLARY DIAGNOSTICS (CHECK IF PERFORMED, GIVE RESULTS IF AVAILABLE, NOTE LOCATION IF STORED, OR TO WHOM SENT):

Cultures:
bacterial:
fungal:
viral:
Heart blood:
serum:
filter paper blot:
Parasitology:
feces:
direct smears:
parasites:

Tissues fixed in 10% formalin (list tissues or specific lesions other than those checked above):

Tissue fixed for EM:_____ Tissue frozen:_____

Impression smears:_____

Comments (interpretation of gross findings):

NONHUMAN PRIMATE POST MORTEM EXAMINATION

Collection of tissues

Tissues to be fixed in 10% neutral buffered formalin should be less than 0.5cm thick to ensure penetration of formalin for fixation. Initial fixation should be in a volume of fixative 10 times the volume of the tissues. Agitation of the tissues during the first 24 hours is helpful to prevent pieces from sticking together and inhibiting fixation. Once fixed tissues may be transferred to a smaller volume for shipment.

Labeling of specimen

If pieces are small or not reaily recognizable (e.g., individual lymph nodes) they can be fixed in cassettes or embedding bags or wrapped in tissue paper labeled with pencil or indelible ink. Another alternative is to submit lymph nodes with attached identifiable tissue, e.g., axillary with brachial plexus, inguinal with skin, bronchial with bronchus, etc. Sections from hollow viscera or skin can be stretched flat on paper (serosal side down) and allowed to adhere momentarily before being placed in formalin with the piece of paper. The paper can be labeled with the location from which the tissue came. The formalin container should be labeled with the animals name or number, the age and sex, the date and location, and the name of the prosector.

Tissues to be preserved

From the skin submit at least one piece without lesions, a nipple and mammary gland tissue, scent gland, any lesions and subcutaneous or ectoparasites.

Axillary and or inguinal lymph nodes may be submitted whole from small animals and should be sectioned transversely through the hilus in large primates.

Mandibular, and/or parotid salivary glands should be sectioned to include lymph node with the former and ear canal with the latter.

Thyroids, if it is a small primate, may be left attached to the larynx and submitted with the base of tongue, pharynx, esophagus as a block. In larger primates, take sections transversely through the thyroids trying to incorporate the parathyroids in the section.

Trachea and esophagus and laryngeal air sac sections may be submitted as a block.

Cervical lymph nodes may be submitted whole if small or sectioned transversely.

A single sternebra should be preserved as a source of bone marrow. A marrow touch imprint may be made from the cut sternebra and air dried for marrow cytology.

Section of thymus or anterior pericardium should be taken perpendicular to the front of the heart.

Heart: weigh and measure heart after opening but before sectioning. Please fix longitudinal sections of left and right ventricles with attached valves and atria in large animals and the whole heart opened and cleaned of blood clots in smaller animals. In tiny animals the heart may be fixed whole after cutting the tip off the apex.

Lungs: if possible inflate at least one lobe by instilling clean buffered formalin into the bronchus under slight pressure. Fix at least one lobe from each side and preferably samples from all lobes. In little animals the entire "pluck" may be fixed after perfusion and sampling for etiologic agents.

Gastrointestinal Track: Take sections of all levels of the GI track including: gastric cardia, fundus and pylorus (or presaccus, saccus, tubular stomach and pylorus in colobines); duodenum at the level of the bile duct with pancreas attached; anterior, middle and distal jejunum; ileum; ileocecocolic junction with attached nodes; cecum and (in apes) appendix; ascending, transverse and descending colon. Open loops of bowel to allow exposure of the mucosa and allow serosa to adhere momentarily to a piece of paper before placing both bowel section and paper in formalin; or gently inject formalin into closed loops.

Liver: Take sections from at least two lobes, one of which should include bile ducts and gall bladder.

Spleen: Make sure sections of spleen are very thin if the spleen is congested; formalin does not penetrate as far in very bloody tissues.

Mesenteric (jejunal) nodes: section transversely; colonic nodes may be left with colon sections.

Kidneys: Take sections from each kidney: Cut the left one longitudinally and the right one transversely so they will be identifiable (or label). Please make sure the sections extend from the capsule to the renal pelvis.

Adrenals: small adrenals may be fixed whole but larger ones should be sectioned (left longitudinal and right transversely) making sure to use a very sharp knife or new scalpel blade so as not to squash these very soft glands.

Bladder: sections should include fundus and trigone. Please make sure to include round ligaments (umbilical arteries) in neonates.

Male gonads and accessory sex glands: Section the prostate with the urethra and seminal vesicles transversely. Section testes transversely. If testes are being collected perimortem for sperm retrieval, try to arrange to take small sections before the gonads are manipulated.

Female reproductive organs: Fix the vulva, vagina, cervix, uterus and ovaries from small and medium sized

primates as a block (after making a longitudinal slit to allow penetration of formalin). Rectum and bladder (opened) can also be included in this block. In somewhat larger animals make a longitudinal section through the entire track. In great apes make transverse sections of each part of the track and the ovaries. (See reproductive track protocols from the contraception advisory group if animals are to be included in their database).

Gravid females: weigh and measure placenta and fetus. Perform a post mortem examination of the fetus. Take sections of placental disc(s) from periphery and center and from extraplacental fetal membranes. Take sections of major organs and tissues of fetus (see fetal protocol).

Nervous system: The brain should be fixed whole, or, if too large for containers, may be cut in half longitudinally (preferred) or transversely through the midbrain. It should be allowed to fix for at least a week before sectioning transversely (coronally) into 0.5-1.0cm slabs to look for lesions. Submit the entire brain if possible and let the pathologist do the sectioning, otherwise submit slabs from medulla, pons and cerebellum, midbrain, thalamus and hypothalamus, prefrontal, frontal, parietal and occipital cortex including hippocampus and lateral ventricles with choroid plexus (Note: limited sectioning is advised if the brain is to go to the great ape brain project).

Pituitary and pineal gland: Fix the pituitary whole. Put pituitary in an embedding bag if it is small. If the pineal gland is identifiable, fix it whole. Also remove and fix the Gasserian (trigeminal) ganglia.

Spinal chord - if clinical signs warrant, remove the cord intact and preserve it whole or in anatomic segments (e.g., cervical, anterior thoracic etc.) (please note to which lumbar vertebra the cord extends)

Bone marrow: Take bone marrow by splitting or sawing across the femur, to get a cylinder and then make parallel longitudinal cuts to the marrow. Try to fix complete cross sections or hemisections of the marrow.

Additional sections for fixation: Take sections of any and all lesions, putting them in embedding bags if they need special labeling.

NOTE: It is better to save "too many" tissues than to risk missing essential lesions or details.

CARDIAC EXAMINATION FOR GREAT APES (AND OTHER PRIMATES IN WHICH CARDIAC DISEASE IS PRESENT)

Examine heart in situ.

Check for position, pericardial effusions or adhesions. Collect for culture or fluid analysis if present.

Remove heart and entire thoracic aorta with "pluck".

Examine heart again. Check the ligamentum (ductus) arteriosus for patency. Check position of great vessels. Open pulmonary arteries to check for thrombi.

Remove heart and thoracic aorta from the rest of the "pluck". Examine for presence of coronary fat. Examine external surfaces especially coronary vessels. Note relative filling of atria and state of contracture (diastole or systole at death) and general morphology (the apex should be fairly pointed)

Measure length from apex to top of atria. **Measure circumference** at base of atria (around coronary groove).

Open the heart:

Begin at the tip of the right auricle and open the atrium parallel to the coronary groove continuing into the vena cava. Remove blood clot and examine the AV valves. Cut into the right ventricle following the caudal aspect of the septum and continuing around the apex to the anterior side and out the pulmonary artery. Remove postmortem clots and examine inner surface.

Open left atrium beginning at the auricle and continuing out the pulmonary vein. Remove any clots and examine valves. Open the left ventricle starting on the caudal aspect and following the septum as for the right ventricle. When you reach the anterior aspect, clear the lumen of blood and identify the aortic outflow. Continue the incision around the front of the heart and into the aorta, taking care to cut between the pulmonary artery and the auricle. Open the entire length of the thoracic aorta.

Remove all postmortem clots. You may gently wash the heart in cool water or dilute formalin to better visualize the internal structures and valves. Sever the thoracic aorta from the heart just behind the brachiocephalic arteries. Examine intima and adventitia and section aorta for formalin. Sever the pulmonary vessel and vena cava close to the heart.

Weigh and measure the heart and record.

Measure thickness of right and left ventricular free walls and the septum septum (on the left side, do not measure directly through a papillary muscle). Measure the circumference of the right and left AV valves and the aortic and pulmonary valves using a pliable measuring tape (or use a piece of string and measure the string on a straight ruler).

Take sections for histopathology:

Sections should include:

Longitudinal sections of left and right ventricles AV valves and atria.

Sections of myocardium from left and right ventricles including coronary vessels. Sections of papillary muscles.

Sections from the septum at the vase of the AV valves (area of conduction system).

Fix the entire heart, if possible, by immersion in 10% buffered formalin for more detailed examination by a cardiac pathologist.

Other vessels:

Make sure to examine the abdominal aorta, iliac arteries and popliteal arteries (frequent sites of aneurysms in humans). Note the location and severity of fibrous plaques, fatty streaks and atherosclerotic plaques and presence of mineralization or thrombosis (a diagram of lesion location would be helpful).

POSTMORTEM EXAMINATION OF PRIMATE FETUSES AND NEONATES

External examination of the fetus:

Weigh the fetus and **make body measurements.**

Measure the placental disc(s) and weigh the placenta. Note umbilical length and vascular patterns on the placenta. Note presence of hair, freshness of the carcass (if dam is dead, is the decomposition of the fetus consistent with that of the dam) and any evidence of meconium staining.

Internal examination of the fetus:

Follow the general primate necropsy protocol.

Make sure to note whether ductus arteriosus and foramen ovale are patent. Note also whether the lungs are aerated and to what extent.

Note dentition / erupted teeth.

Identify umbilical vein and arteries and check for inflammation. Make sure to save umbilicus and round ligaments of the bladder (umbilical arteries) for histology.

Make sure to save a growth plate (e.g., costochondral junction or distal femur) in formalin.

Cultures:

Take as many of the following as possible: Stomach content or swab of the mucosa; lung; spleen or liver; placental disc and extra-placental membranes. Do both aerobic and anaerobic cultures if possible.

POST MORTEM EXAMINATION OF THE AIR SACS OF ORANGUTANS AND OTHER PRIMATES

Examine the skin over the air sac for signs of fistulae or scars. Note thickness of the skin and presence of fat or muscle overlying the air sac..

Incise the air sac through the skin on the anterior aspect.

Note color and texture of air sac lining.

Note presence or absence of exudate.

Note presence or absence of compartmentalization by connective tissue and presence of diverticulae.

Note extent of air sacs (e.g., under clavicle, into axilla, etc.)

Identify and describe the opening(s) from the larynx into the air sac (e.g., single slit-like opening, paired oval openings etc.). Note any exudate.

Note the location, size and shape of the opening in the larynx (e.g., from lateral saccules or centrally at the base of the epiglottis). Note length of any connecting channel between larynx and airsac and direction a probe should take to go from inside the larynx to the air sac.

Cultures:

Please culture several different sites within the air sacs (we need data to determine normal flora and if infections are "homogeneous" or compartmentalized).

Appendix H: Example Enrichment List for Chimpanzees

Approved Enrichment List

Category A - Scents and Spices

Allspice
Basil
Bay leaves
Catnip
Chives
Cilantro
Cinnamon
Citrus zest
Cloves
Dill
Diluted Essential Oils
Extracts
Fennel
Garlic
Hunting scents
Lavender
Mint
Nutmeg
Onion
Oregano
Pepper
Rosemary
Sage
Tabasco
Tea
Thyme

Category B - Change in Diet Presentation

Cooked fruit
Cooked vegetables
Diced fruit
Diced vegetables
Dried fruit
Dried vegetables
Food floating in water
Food frozen in ice
Frozen fruit
Frozen vegetables
Grated produce
Mashed potatoes
Pureed produce
Whole fruit
Whole vegetables
Skewered on branches

Category C - Food Items

Ice treats
Kool-Aid - sugar free (can be used for ice treats)
Jello - sugar free
Applesauce (see forage sheet for amount)
Jam - sugar free (see forage sheet for amount)
Raisins (see forage sheet for amount)
Frozen blueberries (see forage sheet for amount)
Cereal - sugar free (see forage sheet for amount)
Pasta (see forage sheet for amount)
Popcorn - air popped (see forage sheet for amount)
Rice (see forage sheet for amount)
Steel Cut Oatmeal (see forage sheet for amount)
Honey (1-2 x's per month, 1 TBSP per animal)
Peanut butter (1-2 x's per month, 1 TBSP per animal)
Peanuts (10 per animal)
Sunflower Seeds (1 TBSP per animal)
Crickets (10 per animal)
Waxworms (10 per animal)

Mealworms (10 per animal)

Category D - Browse

Alder
Amelanchier
Apple
Arborvitae
Aspen
Bamboo
Blackberry
Box Elder
Cottonwood
Dogwood
Elm
Ficus
Grapevine
Grass Hay
Hackberry
Hawthorn
Hibiscus
Linden
Mulberry
Pear
Poplar
Raspberry
Redbud
Rose
Silver Maple
Snowberry
Sugar Maple
Willow

Also see Browse List on LPZ Intranet

Category E - Occupational

Stream of water from hose or sprinkler
Termite mound (non-study periods only)
Food in brown paper bags
Food buried in browse
Food buried in substrate
Food in burlap (prevent ingestion of burlap)
Food in gourds
Food in puzzle feeders
Food wrapped in large greens / browse leaves
Food in baskets *
Kids activity toys * (prevent ingestion)
Bubbles (must have MSDS for approval) *

Crayola chalk & crayons (Chimpanzees only) *
Crayola washable finger paint (Chimpanzees only) *

Category F - Attached Furniture

Bamboo wind chimes hung
Black rubber tubs hung
Boomer balls hung
Cargo nets hung
15 gallon barrel hung *
30 gallon barrel hung *
55 gallon barrel hung *
Hammock hung *
Pallets hung *
Ropes hung *
Spools hung *
Tires hung *
(All hung furniture must be done safely to prevent entrapment)

Category G - Manipulable Objects

Black rubber tubs (prevent ingestion)
Boomer balls
Branches (non-toxic)

Grapevine balls

Grapevine wreaths
15 gallon barrel *
30 gallon barrel *
55 gallon barrel *
Kiddy pools * (prevent ingestion)
Kids activity toys * (prevent ingestion)
Spools * (prevent ingestion)
Tires * (prevent ingestion)
Combs * (prevent ingestion)
Deckbrushes * (prevent ingestion)
Hairbrushes * (prevent ingestion)
Toothbrushes * (prevent ingestion)
Kong toys * (prevent ingestion)

Category H - Paper

Cardboard boxes*
Cardboard tubes* (NO toilet paper rolls)
Paper bags*
(Only brown boxes, paper bags, tubes with no printing & with staples, stickers, tape removed can be used on exhibit)
Paper cones *
Shredded paper *
Phone book pages *

Category I - Approved Source Substrate

Branches (non-toxic)
Grass clippings
Grass Hay
Leaf litter (non-toxic)

Peat moss
Sand

Snow
Sod
Sphagnum moss
Straw

Category O - Other Sensory Items

Auditory
Plastic mirror * (prevent ingestion)
Alpaca hair (properly cleaned per SMRH protocol)
Snake sheds (properly cleaned per SMRH protocol)
Blankets * (NOT JoJo's troop) (prevent ingestion others)
Burlap (prevent ingestion)
Sheets * (NOT JoJo's troop) (prevent ingestion others)
Tablecloths* (prevent ingestion)
(Only brown, tan & green tablecloths used on exhibit)

Top soil
Wood shavings (non-toxic)
Wood wool

Category J - Keepers' choice

* Non-naturalistic items. To be used only in holdings or Auxiliary exhibit. If used in holdings, make sure the items cannot be taken back into A, B, C exhibits.

Appendix I: Example of Enrichment Calendar

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1 **E**	2 **F** or **A**	3 **G** or **B**
4 **D**	5 **I**	6 **J**	7 **H**	8 **O**	9 **A**	10 **B**
11 **D**	12 **C**	13 **E**	14 **H**	15 **F** or **J**	16 **G** or **C**	17 **I**
18 **D**	19 **J**	20 **O**	21 **H**	22 **A**	23 **B**	24 **C**
25 **D**	26 **E**	27 **F** or **A**	28 **H**	29 **G** or **B**	30 **I**	31 **J**

DIRECT OBSERVATION
5 Significant interaction (>5 minutes & returned)
4 Minimal interaction (<5 minutes)
3 Looked at / No interaction
2 Fled from / Avoided
1 No reaction

INDIRECT OBSERVATION
A Significant contact
B Contact (knocked over, moved)
C No evidence of contact

Appendix J: Apes in Media and Commercial Performances

White Paper: Apes in Media and Commercial Performances
Approved by the AZA Board of Directors in July 2008
www.aza.org/white-paper-apes-in-media-and-commercial-performances/

Policy on the Presentation of Animals

The Association of Zoos & Aquariums (AZA) is dedicated to excellence in animal care and welfare, conservation, education, research, and the presentation of animals in ways that inspire respect for wildlife and nature. AZA's position is that animals should always be presented in adherence to the following core principles:

1. Animal and human health, safety, and welfare are never compromised.
2. Education and a meaningful conservation message are integral components of the presentation.
3. The individual animals involved are consistently maintained in a manner that meets their social, physical, behavioral, and nutritional needs.

Apes in Media and Commercial Performances

Apes, including chimpanzees, gorillas, bonobos, orangutans, and gibbons, are intelligent, sensitive, long-lived and highly social animals. As humans' closest living relatives, they are fascinating, and ape infants are magnetically appealing. These attributes have made apes popular as performers in commercial entertainment and advertising programs. But this popularity and attractiveness masks the often cruel and dangerous practices commonly required to make apes compliant in such appearances.

This White Paper presents a brief summary of the justification for:

- Eliminating the use of apes as performers in commercial entertainment.
- Establishing standards to ensure that public presentations and interpretive programs portray apes respectfully and accurately represent the biology and conservation status of apes.

Rationale

1. An ape infant normally remains with its mother for several years in a group environment, learning social skills essential for development of normal adult behaviors. But apes destined to be performers or photographic props are typically removed from their mother shortly after birth and, thus, are denied opportunities for normal social and psychological development. This has several commercial advantages to an owner. Infants removed in this manner will be appealing and remain submissive for handling by humans for several years. Mothers whose infants are removed will resume sexual cycling and produce another profitable infant quickly.

   But apes raised by humans in the absence of other members of their species will not normally acquire the skills to be socially and sexually competent as juveniles and adults. They may never readjust to life in a normal social group, and thus they are usually relegated to social and sexual isolation, which often leads to abnormal behaviors such as self-mutilation. For these reasons, it typically is not feasible to involve these individuals in conservation-based breeding programs.

2. Although endearing as infants, apes generally become physically powerful and unpredictable as they near adulthood. Their continued use as performers or props is potentially very dangerous to their handlers and audiences. Thus, handlers of ape performers often must use food deprivation, physical abuse, continuous tranquilization, or even electric shock to maintain control. Additionally, the animals may be modified to reduce their ability to cause harm, for example by removing their teeth. It should be noted that the apparent "smile" of a performing chimpanzee is actually a well-documented expression of fear. Such physical and psychological effects are difficult to alleviate even if the ape is rescued and placed in a caring environment. More often however, when ape performers become too difficult to handle, they lose their commercial value and are sold to roadside menageries with inexpert handlers

and often inhumane conditions.

3. Dressing apes in human clothing, or training them to engage in unnatural (usually human) behaviors, while entertaining to some, inaccurately portrays their biology and conservation status. Since conservation efforts rely on informed public opinion, these practices serve to undermine communications vital to achieving conservation. The use of apes in advertisements and other commercial performances can lead people to conclude falsely that apes make good pets.

4. Because apes and humans are genetically so similar, both are susceptible to many of the same communicable diseases. Close and unprotected contact between performing apes, their handlers, and audiences can threaten all with viral, bacterial, and parasite infection.

In summary, the use of apes in media and commercial performances should be eliminated.

Appendix K: Sample Behavioral Ethogram

Adapted from Ross (2009)

Behavior	Code	Definition	Modifiers
Contact Aggression	CA	Aggressive behaviors that must involve some physical contact between individuals. Includes, wrestling, lunge hit, grab, bite, and scratch. May include pilo-erection.	Recipient individual
Receive contact aggression	RC	Receiving any of the above behaviors.	Actor individual
Display	DP	Aggressive behavior without any clear and identifiable recipient. May include pilo-erection, and such behaviors as beating on or moving inanimate objects, stomping, slapping, swaying, hooting, chest-beat, or running. If these behaviors are directed towards an individual, score as non-contact aggression (NC).	None
Non-contact aggression	NC	Aggressive behaviors directed to another individual, that do not include any physical contact. Includes lunge, rush, and threats.	Recipient individual
Receive non-contact aggression	RN	Receiving any of the above non-contact aggression behaviors	Actor individual
Submissive behavior	SB	Includes crouching, bobbing, fleeing, avoiding, fear grimacing, bared teeth screaming and pant grunting.	None
Mount	MT	Includes any component of a series of sexual behaviors including mounting, being mounted, thrusting, being thrust-mounted, and complete copulation. Ventral surface of one animal may be in contact with dorsal/ventral surface of another briefly or for extended period. May occur with or without full penetration. Also includes unsuccessful copulations due to incorrect orientation or unreceptive partner.	Recipient individual
Sexual examination	SX	Visual, oral or manual inspection of the ano-genital region of another individual or self. This should not be confused with grooming or manipulation of the anus to obtain feces.	Recipient individual
Receive sexual examination	RX	Receiving sexual examination (see above)	Actor individual
Masturbation	MS	Using a body part, object, or part of the cage to stimulate own genitals. Be sure to separate this from grooming of the genitals or manipulation of the genitals to obtain feces.	None
Other Sexual	OS	Other sexual behaviors not named above. May include sexual solicit, sexual present, or individual-specific behaviors related to a state of oestrus, such as rapid tapping of the posterior.	Recipient individual
Coprophagy	CO	Deliberate ingestion of feces. Can be from themselves or another individual.	None
Regurgitation and reingestion	RR	Deliberate regurgitation accomplished by various methods including lowering head to the ground, bobbing head, or more subtle techniques. The vomitus may be retained within the mouth or expelled into hand or substrate before being reingested.	None

Urophagy	UR	Deliberate ingestion of urine. Can be from themselves or another individual.	
Self-pluck	PK	Pulling out own hair; may be ingested.	None
Hair-pluck	HP	Pulling out another animal's hair; may be ingested.	Recipient individual
Receive pluck	RP	Recipient of the above behavior	Actor Indv
Idiosyncratic body manipulation	IB	Repeated and sustained manipulation of a specific area of own body, such as eye-poking, self-patting or ear-covering.	None
Idiosyncratic body-movement	IM	Repeated and sustained movement of body, such as rocking or head-bobbing, with a definitive repetitive pattern.	None
Social Play	SP	Non-aggressive interactions involving two or more animals. Never accompanied by pilo-erection or agonism; may be accompanied by play-face and/or laughing. Includes rough-and-tumble play (fast-paced, vigorous locomotion, wrestling, hitting, pulling, chasing, biting, etc.), quiet play (slower-paced, gentle-tickling, finger and toe manipulation, etc.) and also includes social play initiation.	Play partner
Social Groom	SG	Picking through hair or at skin of another individual and removing debris with hands and/or mouth. Does not include pulling hair.	Grooming partner
Receive social groom	RG	Receiving social groom (see above). If two individuals are mutually grooming, score SG.	Grooming partner
Self-directed behavior	SF	Picking through own hair or skin and removing debris with hand and/or mouth. Does not include pulling hair or scratching.	None
Scratching	SC	Raking of fingernails over skin; may be smaller movements of hand, or larger sweeping scratching involving arm movement.	None
Solitary Play	PA	Individual may play quietly by itself with hands, fingers and toes, other body parts, or an object may be handled and be the focus of play. The individual may be tossing, holding, wearing, carrying, chewing or making other contact with the object while making playful movements. May be either boisterous or quiet. May also include active play involving swing, dangling, leaping, somersaults, running, gamboling, pirouetting and bouncing. Vigorous locomotion or rotation of the whole body or its parts is typical.	None
Feed/Forage	FF	Individual is handling, manipulating or ingesting food items such as primate chow, biscuits, fruits, vegetables, natural vegetation, or enrichment. Includes foraging through bedding or other materials in search of desired food items.	None
Drink	DK	Individual is ingesting water. May be from nipple lixit, ground source, waterfall or standing water pool. Does not include ingestion of urine.	None
Horizontal Locomotion	HL	Individual changes location in horizontal space by walking, running, crawling, etc. The change in location must be greater than one body length.	None
Vertical Locomotion	VL	Individual changes location in vertical space by climbing, sliding, jumping, etc. The change in location must be greater than one body height.	None

Object manipulation and examination	OE	Individual visually examines or manipulates various items. A modifier is selected to delineate the form/function of the manipulation: • Fishing (use of an item to probe an opening). • Hammering (use of a solid object to strike another solid object) • Food (manipulation or examination of a food item that does not include ingestion) • Browse (manipulation or examination of sticks, hay, straw, mulch, twigs. Not in the context of fishing or nest-building) • Environment (manipulation or examination of physical environment including walls, glass, trees, mesh, etc.) • Nest (manipulation of materials to construct or modify a nest site). • Enrichment (manipulation of items that are clearly supplementary enrichment items added to the environment (boxes, toys, etc. but not food) • Animal (manipulation or examination of an animal – dead or alive – such as a squirrel or rabbit) Manipulation of food items is scored as feed/forage (FF), unless those food items are clearly not being ingested (ie. manipulating banana peel without eating it). May include picking up, pushing, examining, picking at, licking, scratching, pulling, ripping, and/or shaking.	Object
Inappropriate Infant handling	IA	Individual handles infant in rough or inappropriate manner such as dragging infant by the leg. Subject does not have to be the mother of the infant. This behavior is non-aggressive in nature…otherwise score as contact aggression towards infant.	Individual being handled
Carry other	CR	Individual bears the full weight of another individual and is moving. Stationary individuals will not be scored as carrying. Can be carrying other on the back, head, side or other body parts as long as the individual being carried is completely off the ground.	Individual being carried
Be carried	BC	Individual is off the ground and completely upon another moving individual.	Individual doing to the carrying
Nursing	NU	Individual has infant at breast and is allowing the infant to suckle.	None
Suckle	SU	Individual has mouth in contact with mother's nipple and is receiving or attempting to receive milk.	None
Attention to keeper area	AK	Individual maintains gaze directed towards keeper area. Must be maintained for longer than 3 seconds. Ape must be within 1 meter of the barrier.	None
Attention to public area	AP	Individual maintains gaze directed towards member of the public. Must be maintained for longer than 3 seconds. Ape must be within	None

		1 meter of the glass/public barrier. If keeper or staff is in the public area and is the object of attention, score as this behavior (AP).	
Attention to exhibit	AE	Individual maintains gaze directed into immediately adjacent exhibit space such as from the indoor dayroom, through the glass into the outdoor yard.	None
Inactive	IN	Individual is not moving and not active in any other behaviors listed. Eyes may be open or closed.	None
Out of view	OV	Individual's behavior is not able to be identified due to visual obstruction.	None